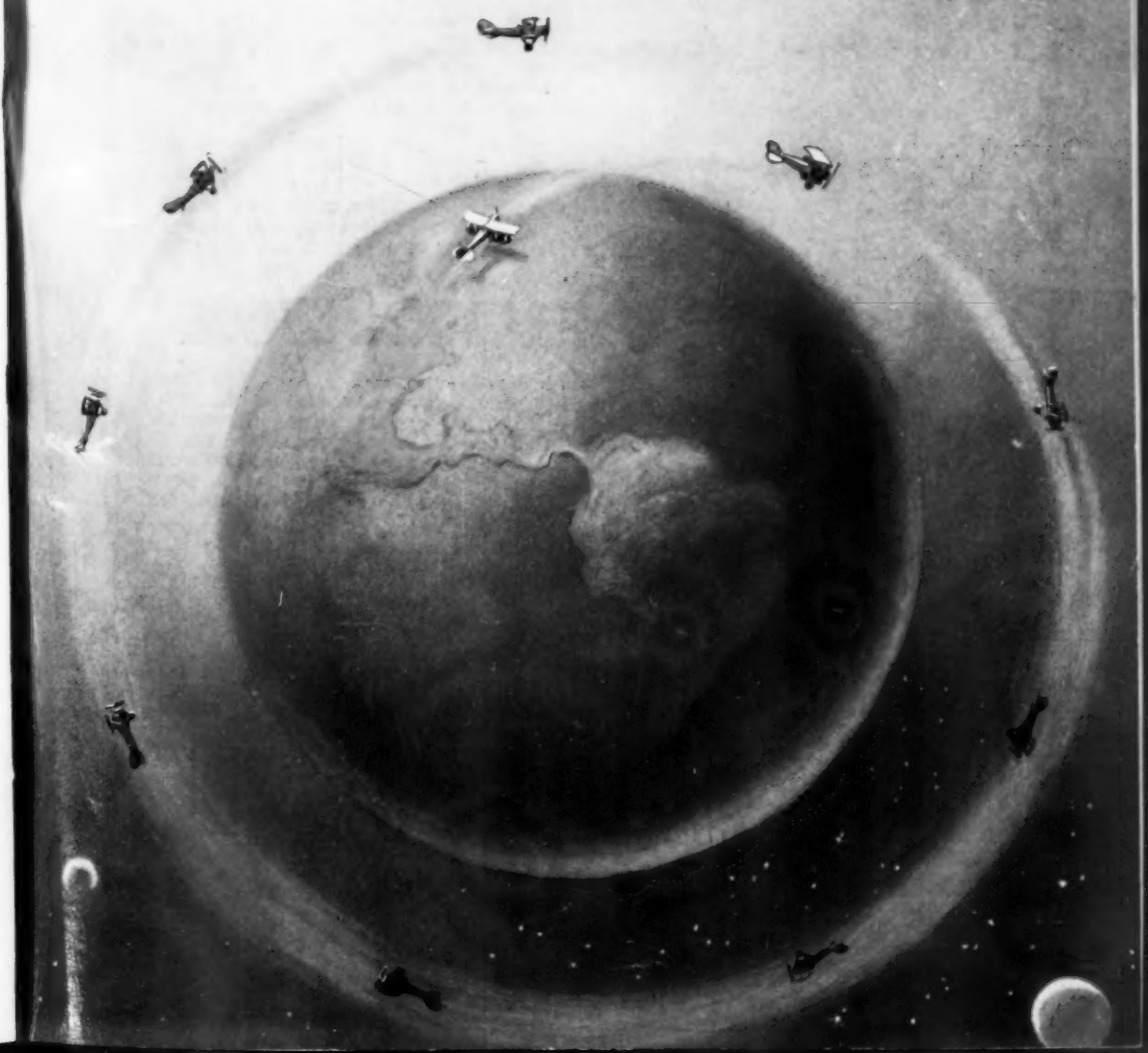
September 20 Cents

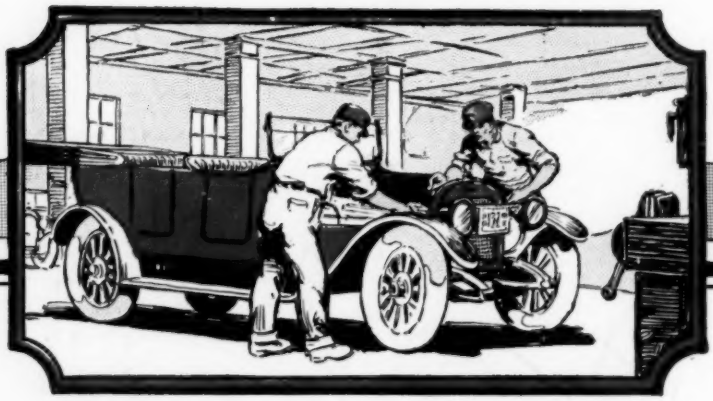
...AL LIBRA...

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. U.S. PAT. OFF.





—learn the automobile and tractor business in 6 weeks

Start a Garage: Every 10 Automobiles, Trucks, or Tractors require the services of one mechanic. And where 10 motor mechanics are needed, less than one is available. Right in your own neighborhood, you need only to let it be known that you are a RAHE TRAINED Mechanic and a very small investment will put you into a good paying business at once.

Earn $100 to $400 a Month: Every man 16 years and older can learn here easily and quickly. Begin on the first day you come on real Autos, Trucks and Tractors, under the guidance of Master Mechanic Instructors—one at your elbow constantly for your rapid progress. Thousands of RAHE Graduates now earn up to $400 a month. Many own garages and make more.

RAHE AUTO and TRACTOR SCHOOL

The equipment is modern and complete in every detail—up-to-date Automobiles, Trucks, Tractors, block-mounted Motors, Electric Apparatus and every other equipment necessary to train you in all branches of the business. Acres of floor space in modern, fire proof construction. No tools or "extras" to buy. *You don't need any special talent nor advanced education.* You learn by the same practical methods we used to train thousands of soldier mechanics in 60 days' time. Only additional cost to be trained here is difference in car fare.

Pleasant, economical living accommodations in reputable private homes near the school—all under daily supervision of our own Welfare Department.

Special Tuition Rate Now To assist in the readjustment and rehabilitation now under way, especially to former soldiers, we are making a special offer to those who come within the next few weeks. This special rate applies for Life Scholarship in our complete course.

Write or send coupon at once.

MAIL THIS COUPON for 7-day Trial Offer, wonderful story of opportunities and big 68-page illustrated catalog **FREE**
P.M.2897

Rahe Auto and Tractor School
Dept. 2897 Kansas City, Mo.

Name.....

Address.....

Age.....*Occupation*.....

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 32 SEPTEMBER, 1919 No. 3

Magnificent Greenhouse Tops Largest Hotel

IN the very heart of America's largest city, opposite the largest railway terminal, there has just been opened the most magnificent and sumptuous of greenhouses. The ground at that point is of almost incredible value; but the new greenhouse, to make its location still more peculiar, is more than 20 stories above the ground—perched on the roof of the Pennsylvania hotel, which is, to use the superlative once more, the largest in the world. The conservatory in the sky is, as a matter of fact, a group of three huge glass-inclosed halls each a wonder in itself.

Other extraordinary qualities might be expected of such an unusual greenhouse as this, and they are not lacking. The

Great Triple Greenhouse on the Roof of the Biggest Hotel in the World: Several Hundred Feet above the Ground, the New "Sky Conservatory" Is Remarkable for a Number of Unusual Features, Including an Unsupported 55-Foot Span of Glass Roof; Walls Decorated to Give the Illusion of Distance, and Lighting Fixtures That Resemble Huge Butterflies

BY COURTESY OF THE AMERICAN GREENHOUSE MFG. CO.

feature first to strike the eye is the great unsupported span of glass-paneled roof, 55 ft. from side to side. The next effect that startles the visitor is the apparent absence of confining walls—the illusion of distance as the vision travels on into green jungles. That is the decorator's art, of course; the walls are treated to produce just that effect. And the illuminating engineer has coöperated. Fairy butterflies with incandescent bodies reflect their light downward from translucent wings, veined and shaded in vivid semblance of life. Birds, too, but they are real, with plumage that outcolors the best work of the colorists—inhabitants of the tropics transplanted to the make-believe. Hotel life takes a considerable stride away from the conventional with this innovation. Not merely can its devotees take their ease in sybaritic enjoyment of nature's clever counterpart; they may pluck, with their own hands, the precious winter grapes, the tangerines and tropic fruits of stranger sort, and so come to realize that these gastronomic delicacies grow beautifully on trees and vines, and not on silver plates.

Thus is a new and rare flavor brought to the jaded palate of the traveler, and a concentrated breath of wilderness air held captive a few hundred feet above the unromantic pavement of the crowded city street.

AN EXTRAORDINARY SUBMARINE ACCIDENT

By JOHN EDWIN HOGG

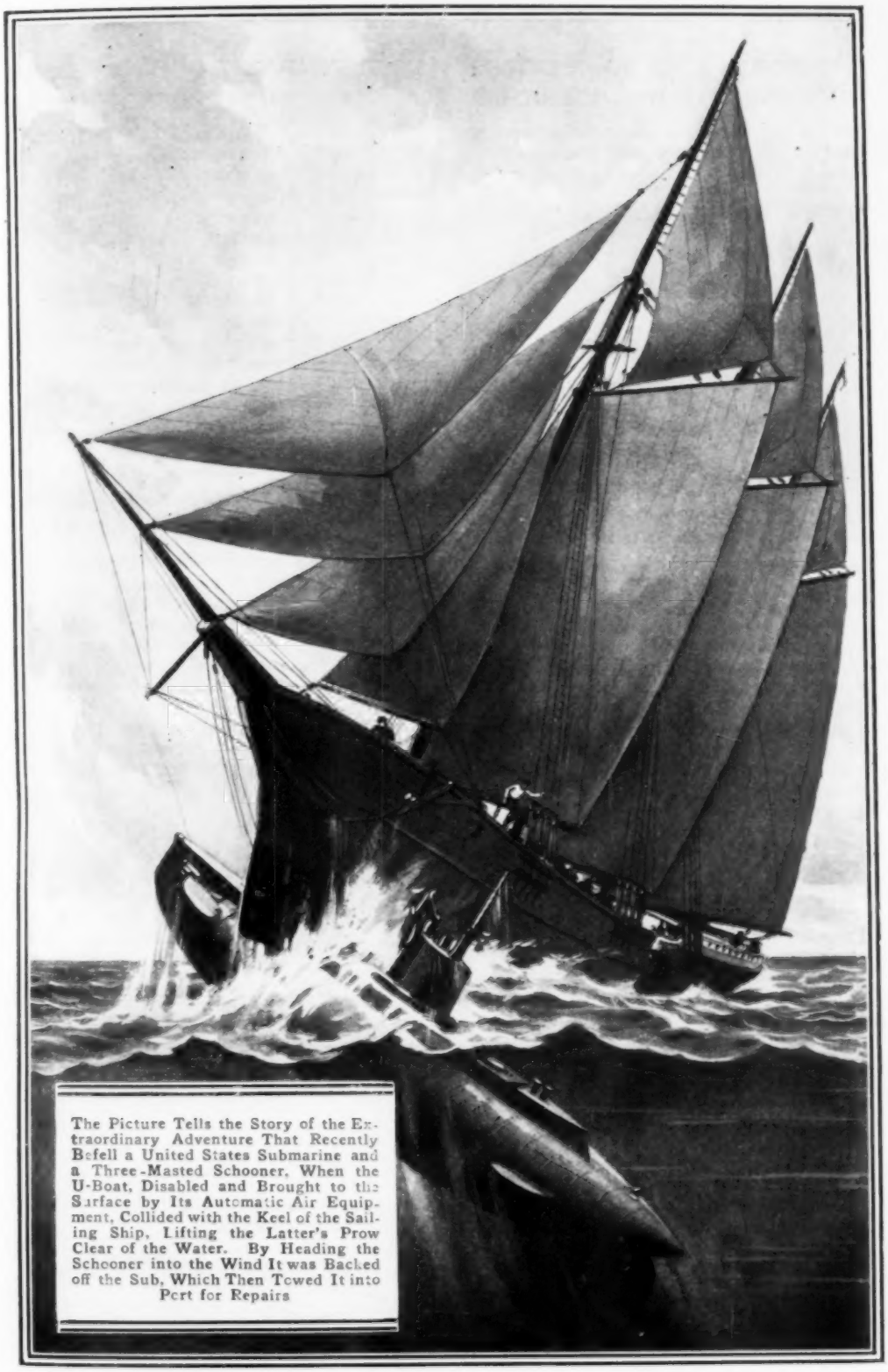
AFTER a practice dive of several hours' duration, cruising submerged at a depth of 65 feet, the United States submarine ——— suddenly became unmanageable, and began to sink. Something had apparently gone wrong with the Kingston controls (operating the ballast tanks), and the crew was unable to bring the craft to the surface. All our submarines are now equipped with blowers which empty the ballast tanks automatically whenever the submarine sinks to the depth which is its safety limit. In this particular submarine the safety limit happened to be 300 feet. The boat sank to that depth when the automatic blowers suddenly functioned, and the craft shot upward like a cork. Meanwhile the operator at the submarine signaling station had heard no sounds of any surface vessels in the vicinity, so, when the craft began to rise, no attempt was made to check it. The surprise of the crew can be well imagined when, as the boat neared the surface, there was a mighty crash and the ascent suddenly stopped. Instead of bobbing out on the surface the submarine had come up under a three-masted schooner which was sailing peacefully on its way, its crew unaware that a submarine was anywhere near.

The U-boat, which was one of the latest and largest American type, struck crosswise of the schooner's keel, about one-third aft of the bow, which was reared several feet out of the water as the submarine's conning tower caught its keel. The bow of the submarine also went high out of the water. The schooner, having all sails set and running before the wind, continued to drive onto the deck of the U-boat. Thus locked together, the two boats began drifting down wind.

Several members of the schooner's crew thinking the craft had gone on the rocks leaped over board. Others took to the lifeboats. Because of the crippled condition of the submarine its commander refused to attempt submerging again. The situation was surveyed through one of the two periscopes, which was undamaged in the accident. Then the forward deck hatch was opened. Two officers climbed out, and with the aid of ropes reached the deck of the schooner. The submarine was then closed up while the officers directed the lowering of the sails. After the two vessels had been brought around in the wind the schooner's sails were used to pull it, stern first, clear of the sub.

Besides losing one of its periscopes, the submarine had a big dent in the forward deck, and the front of its conning tower was stove in. The schooner was not seriously damaged, but was leaking quite badly. Cruising on the surface, the submarine took the schooner in tow, and both vessels went into port and dry dock.

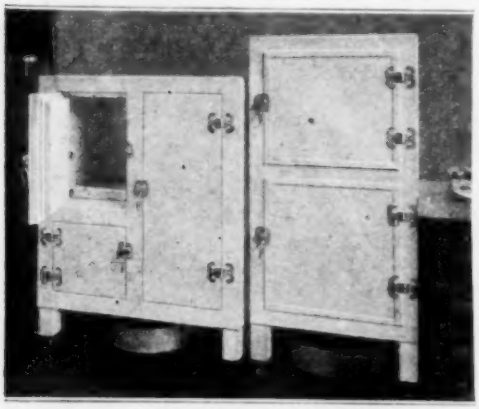
¶ Fishing is expected to become an important industry on Sardinia, an island off the coast of Italy, when a recently formed aerial transportation company begins flying airplanes between the island and Rome. Natives in the past have limited their catches to supply local needs only, due to the lack of swift shipping facilities to the mainland.



The Picture Tells the Story of the Extraordinary Adventure That Recently Befell a United States Submarine and a Three-Masted Schooner, When the U-Boat, Disabled and Brought to the Surface by Its Automatic Air Equipment, Collided with the Keel of the Sailing Ship, Lifting the Latter's Prow Clear of the Water. By Heading the Schooner into the Wind It was Backed off the Sub, Which Then Towed It into Port for Repairs

MICROBES FIND NO CREVICES IN CONCRETE REFRIGERATOR

As it gains in popular confidence, concrete is used in more and stranger ways. Now it is the concrete refrigerator, quite



These Indestructible Refrigerators Represent the Latest Commercial Adaptation of Concrete. They Are Free from Germs and Odor, as There Are No Joints or Crevices to Hold the Filth

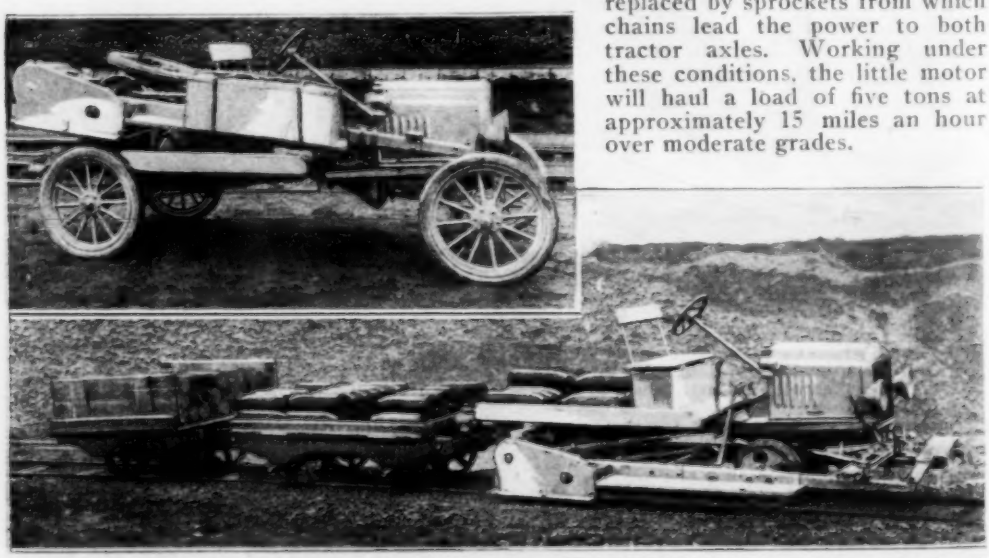
compact and far from unsightly with its gleaming metal fittings and glazed finish. Chief among its obvious merits is its indestructibility; though it is sanitary, too, as there are no joints nor crevices to conceal dirt and germs. The doors will always fit snugly as the material is comparatively unaffected by changes in the temperature or humidity of the air.

TO EXTEND YELLOWSTONE PARK AROUND JACKSON LAKE

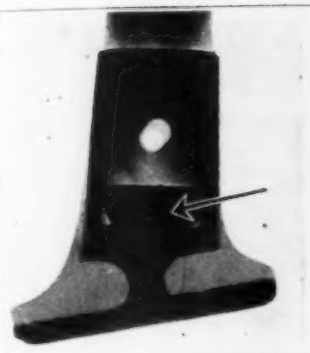
Yellowstone National Park is expected to grow 1,265 square miles larger as soon as the present congress reaches a bill neglected by the last session. The proposed extension, 30 miles to the south of the established boundary, takes in Jackson Lake and the wonderful mountain scenery about it, part of the famous Jackson's Hole country. Besides providing the only variety of scenic beauty now lacking in the park, the addition includes the summer grazing ground of America's last large herd of elk, and some of the finest trout-fishing water in the country. Victor, Idaho, is the nearest railway point, but there are several good auto roads.

LIGHT AUTO CHASSIS BECOMES MILITARY RAILWAY TRACTOR

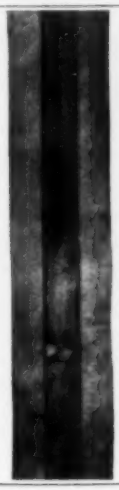
The British army authorities have developed a number of fittings for the chassis of a well-known low-priced car by which it is quickly converted into a narrow-gauge locomotive. All the parts necessary for the conversion are carried by the car itself, so that it may travel to the railhead on its own wheels and there be transformed into a railway tractor. The operation takes about one hour. Front and rear wheels are removed and the chassis mounted on the tractor frame of channel steel. The rear wheels are replaced by sprockets from which chains lead the power to both tractor axles. Working under these conditions, the little motor will haul a load of five tons at approximately 15 miles an hour over moderate grades.

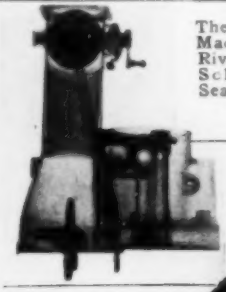


The Little Passenger Car is Shown Above as It Travels to the Railhead under Its Own Power, Carrying All the Fittings Necessary for Its Transformation into a Railway Tractor. The Change is Made, as Shown Below, by Removing the Wheels, and Bolting the Chassis to an Auxiliary Frame of Channel Steel



Radiograph of Airplane Skid, Revealing Packing between the End and the Bottom of the Socket, the Skid having been Cut Too Short





At the Left, the Radiograph of a Three-Ply Airplane Spar Shows Knots and a Grub Hole in the Center Lamination. Above Is a Carburetor Radiographed in Operation, Revealing Some Hidden Defects

The X-Ray Photograph Made Clear the Faulty Riveting and Defective Soldering along the Seam of a Steel Gasoline Tank

X-RAY FINDS HIDDEN FAULTS IN WOOD AND METAL

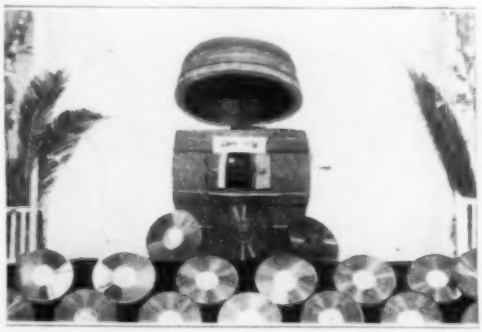
Though the X-ray has been working its way to a position of indispensability in the surgical field for some 24 years, its great value to industry is just beginning to be appreciated. An outstanding example of its usefulness as an inspector of superhuman powers was afforded recently in England, during an examination of new air craft. Radiographs in this case revealed serious defects of material and workmanship that no amount of visual study would have found. In a wooden spar of three laminations, the middle, and hidden, section was shown to contain two knots and a grub hole. When the hollow box strut was X-rayed, the strengthening block in the end was plainly seen to be not only badly fitted, but actually split by its fastening screws. It was also made obvious that a wood skid had been cut too short for its socket, and the resulting empty space had been filled with packing. Even the faulty riveting along the seam of a steel gasoline tank "came to light" in the photograph, as well as a defect in a working carburetor. Factory practices of this sort will probably be terminated by consciousness of the new inspector's power.

COMPRESSED AIR HAMMERS TAMP CONCRETE SHIP

Pneumatic hammers were employed to tamp the concrete used in constructing the steamship "Polias," said to be the second largest vessel of its type afloat. After the mixture had been poured into the hull form, the hammers were applied to the boards, and the vibration caused by their blows thoroughly packed the concrete. Two wooden shells, one placed within the other, were used to mold it into the form of a ship. In the 5-in. space between the shells was placed an intricate network of steel for reinforcement of the concrete. It was found impossible to tamp it in the ordinary manner, because of the danger of shifting the reinforcing material.

WINDOW DISPLAY FEATURES BEER-KEG PHONOGRAPH

Tears spring to many an eye as the beer-keg phonograph in the window of a large music house plays "How Dry I Am," "Drink to Me Only with Thine Eyes," and other classics. In spite of its past, the honest old keg makes music just as sweet as do its polished neighbors in the show window.



The Place of Honor in the Window Display of a Music House was Given a Beer Keg Which, with a Few Alterations, Became a Practical Phonograph

COPYRIGHT, KEYSTONE VIEW CO.

This Unusual Photograph of the "R-34" was Snapped Just One Minute After Major Pritchard Leaped from the Forward Gondola to Superintend Landing Arrangements at Roosevelt Field, Long Island

BRITISH DIRIGIBLE MAKES PIONEER ROUND TRIP OVER ATLANTIC OCEAN

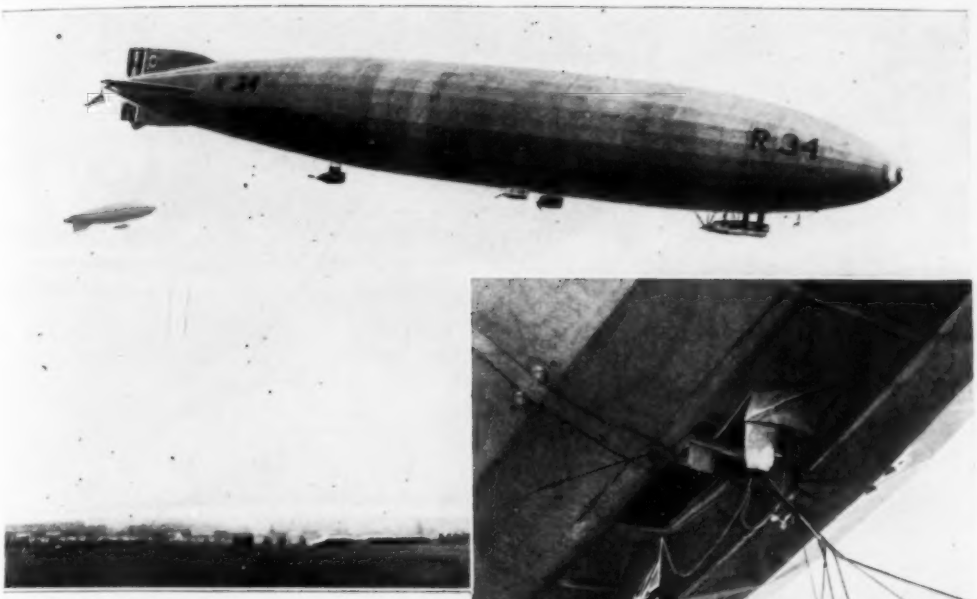
By PAUL A. JENKINS

BRITAIN'S transatlantic dirigible, the "R-34," poked its huge bulk out of the clouds northeast of Pulham, England, in the early morning of July 13. Circling the aerodrome three times it glided smoothly to the ground. A rope curled down from the forward gondola to the landing crew on the field. In a moment hundreds of eager hands grasped ropes and railings, and, straining at the great structure, slowly "walked" it into its shed without accident.

Conducted with workmanlike precision, this operation marked the finish of the first aerial round trip over the Atlantic Ocean. In just the same easy way the "R-34" rose from East Fortune, Scotland, on July 2; with the same unhurried exactness the long craft was navigated through darkness and fog, around thunderstorms, and even down Broadway. The keynote of the whole successful performance was sounded by Major Scott on descending from his ship at Pulham Aerodrome. He remarked that "the voyage home has been without incident." No better proof of success could be desired. Brig. Gen. Maitland, who made the round trip as representative of the British Air Ministry, seems justified in saying that the commercial practicality of long-distance air voyages was amply demonstrated. Confirming this is the remark made by Col. Wm. N. Hensley, Jr., representative of the U. S. Army Air Service, who was privileged to make the return journey: "While the sea below was tossed by a 40-mile gale, we were cruising along in comfort on an even keel. Regular airship service between Europe and America is bound to come, and soon."

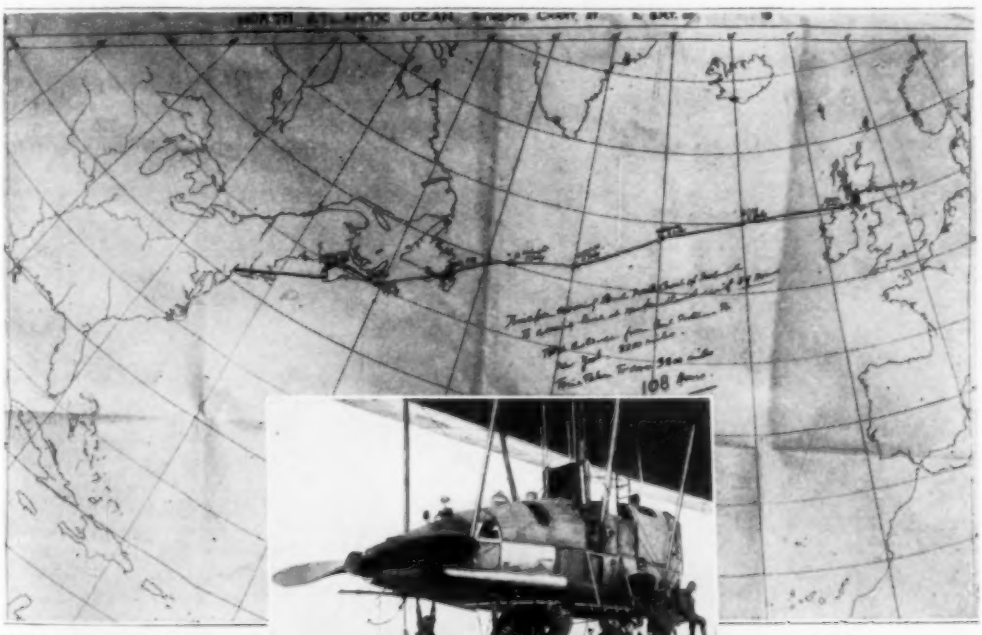
And in reckoning the value of the "R-34's" performance, one must bear in mind that larger dirigibles are being built. Airmen of the future will class the "R-33" and the "R-34" with the caravels of Columbus. Yet the "R-34" is tremendously large and a source of amazement to those permitted to inspect it. The cigar-shaped frame is 665 ft. long and 79 ft. in maximum diameter. From this rigid frame are suspended four gondolas, one forward, two amidships, and one at the stern. In the forward gondola, which corresponds to the bridge of an ocean liner, ride commander, navigator, and radio operator; from it run speaking tubes, electric communication wires, and steering controls. Each gondola carries a 275-hp. engine driving a large pusher propeller, except that the rear gondola carries two motors, revolving one propeller.

A tour of inspection about the cavernlike interior of the big envelope is the ambition of everyone who sees it. A deck or "cat's walk," 15 in. wide and 600 ft. long, runs from bow to stern along the bottom of the framework. Above it are



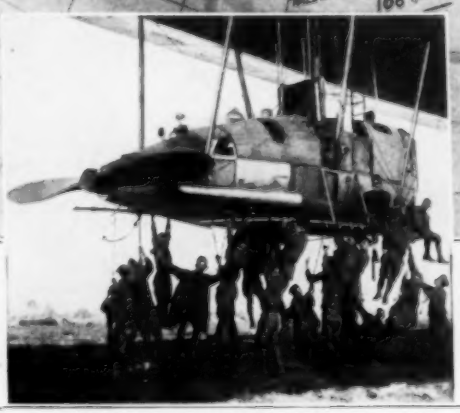
PHOTOS COPYRIGHT, KEYSTONE VIEW CO.

The British Transatlantic Dirigible "R-34" is Shown Making the Slow Vertical Descent to Roosevelt Field, Long Island, on the Morning of July 6, Completing the Longest Air Journey Ever Made. In the Distance Floats an Escorting "Blimp" from the U. S. Navy. On the Field Were 600 Soldiers Ready to Catch the Mooring Lines and Weave Them through the Rings of the Huge Concrete Anchors. At the Right is Shown the Rent Torn Next Day by a Breaking Cross Girder to Which One of These Lines was Attached



COPYRIGHT, INTERNATIONAL FILM SERVICE

On This Chart the Navigator of the "R-34" Marked the Successive Positions of the Great Air Liner. His Office was Fitted with Chart Racks, Tables, and Every Desirable Navigating Instrument



At the Left Are a Few of the Thousand American Soldiers Who were Drilled As a Landing Crew for the Reception of the "R-34." In the Absence of a Hangar the Vast Framework Was in Constant Danger of a Smash-Up

COPYRIGHT, UNDERWOOD & UNDERWOOD

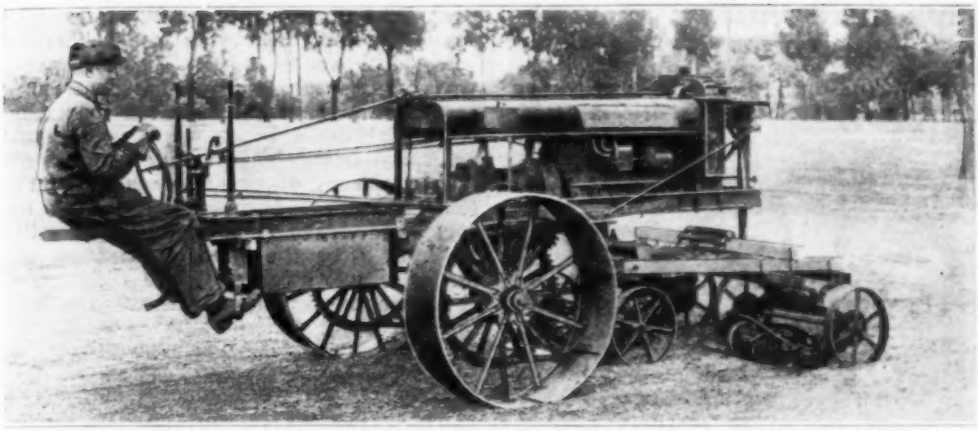
the 18 ballonettes which hold a total of 2,000,000 cu. ft. of hydrogen gas, each bag in its own compartment. Ranged along the sides are gasoline and water tanks, sleeping hammocks for the crew, and canvas containers holding life belts and parachutes. The "dining salon" is in the center, where the ship is widest, the space measuring about 8 ft. by 20 ft., with tables hinged to the framework. Unfortunately the men have to stand while they eat. Ladders throughout the hull give access to small cockpits in bow, stern, and to the top of the bag. It is interesting to read in General Maitland's diary that the navigating officer was often on top of the bag making his observations in the bright sunlight, while those in the gondolas below were surrounded by gloomy fog.

Because comparatively free from difficulties and disaster, the flight of the "R-34" may be summed up in a few sentences. The craft rose slowly from the hands of the landing party at East Fortune, near Edinburgh, Scotland, on Wednesday, July 2, at 1:42 a. m., the coolness of that hour giving the ship its greatest possible lifting capacity. Low-hanging clouds and darkness envelope it at 100 ft. In the tanks are 4,900 gal. of gasoline; the crew consists of 11 officers and 19 men, not including the stowaway later to be found in the envelope. Fog makes the sea invisible at the start and during almost every subsequent hour of the voyage. By 3 p. m. the wireless operator reports that he is in communication with both sides of the Atlantic. During this and succeeding nights the crew is kept busy with the regular routine, four hours on and four hours off, their working time being spent in navigating, steering, elevating, and nursing the engines. Meals are uniformly pleasant affairs, with hot drinks to be had and phonograph music if desired. At 2 p. m. Thursday, the engineer officer demonstrates a new method of engine repair. He sets the entire crew to chewing gum, with which he closes a crack in a cylinder water jacket. On Friday morning the dreary coast of Newfoundland is sighted, just 59 hours after leaving the coast of Ireland. Saturday, at noon, when 500 miles from New York, the gasoline situation becomes serious. During the afternoon, the precious fluid is consumed even more quickly, as the ship is maneuvered around several severe thunderstorms. On Sunday morning, Major Scott is fearful that gasoline will not hold to Mineola. The engineer officer "comes through" again, however, by scraping the last drop out of more than 60 "empty" tanks, using cups and cooking utensils in the search. This "bonanza," with a favoring wind, brings them to Long Island. On Sunday, July 6, at 9:54 a. m., a perfect landing is made at Roosevelt Field, L. I., the air voyage having consumed 108 hours and 12 minutes, and being remarkable as the longest in the world's history.

COPYRIGHT, KEYSTONE VIEW CO.

This Cheerful Youth is Distinguished as the First Aerial Stowaway to Cross the Atlantic. He Returned a Prisoner on a British Warship

Allowing for the absence of a hangar, the technical arrangements for the landing of the "R-34" were admirable. In anticipation of all possible demands, our navy stored on the field 8,000 tanks of hydrogen gas, 7,000 gal. of gasoline, and 500 gal. of oil. The great bag, so unwieldy on earth, was anchored and guarded without a mishap. During the three days of its stay the dirigible was seen by tens of thousands, and thoroughly inspected by air-service officers of the U. S. Army and Navy. Being advised of advancing cyclonic disturbances on July 9, Major Scott steered his craft from American soil at 11:59 that evening. He courteously circled backward on his course, passing south along Manhattan to let the New York crowd share in the excitement of his departure. The return journey was completed without incident in the remarkably good time of 75 hours and three minutes. With the assistance of favoring winds Major Scott was able to make the first 800 miles over the Atlantic in just eight hours.



Motor Cultivator and Corn Planter with Its Front Wheel Replaced by a Gang of Three Lawn Mowers on a Wood Frame, Which Cut a Good Deal of Grass and Serve Also to Steer the Machine. It is Used to Mow the Lawns of an Illinois Golf Club

MOTOR CULTIVATOR BECOMES GOLF-LINKS GRASS MOWER

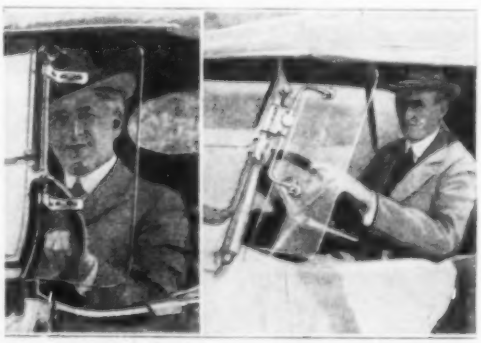
That so highly specialized a piece of agricultural machinery as a motor cultivator and corn planter can do other jobs with equal success is being demonstrated in an Illinois town, where one is now used to mow the grass on the golf links. The front wheel of the cultivator was removed, and in its stead was mounted a gang of three 28-in. lawn mowers of the conventional form, fastened to a timber frame. The broad, flat steel tires of the machine roll over the lawn without injuring it, guided by the mowers themselves, which are turned by the regulation steering wheel.

AIRPLANE ECLIPSE EXPEDITION HOUNDED BY MISFORTUNE

A steamship cleared from New York two weeks before the recent solar eclipse, bearing Prof. David Todd of the Amherst College Astronomical Observatory, a naval seaplane, and a crew to fly it. The professor hoped to sail to a point about 1,300 miles northeast of Pernambuco, Brazil, rising at the time of the eclipse to an altitude high above the clouds. From this position, during the six minutes and fifty seconds of the eclipse, he intended to make observations and take numerous photographs. Consistent misfortune pursued him, however. The steamship broke down soon after leaving America, and was forced to limp into Bermuda for repairs. The party was marooned in Bermuda on the day of the eclipse. They set out for Pernambuco, however; only to encounter a more serious breakdown, attended by actual suffering from lack of food and water. Reaching port, the seaplane was removed from the ship, to be torn from its moorings and wrecked during one of the worst storms in several years. Thus ended the first expedition of its kind.

AUXILIARY WINDSHIELDS SOLD AS AUTOMOBILE ACCESSORIES

Auxiliary windshields, or deflectors, have lately taken their place as useful and desirable automobile accessories. They are simply small pieces of plate glass easily fixed to the frame of the larger windshield where they are effective

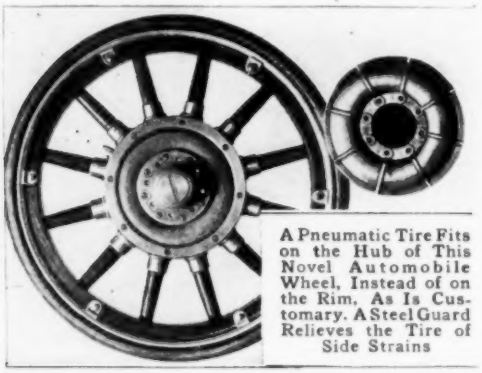


These Auxiliary Windshields are Fast Coming into Favor as Useful Automobile Accessories. Both Types are Quickly Adjusted to Best Guard the Riders

in guarding the rear seats from wind and dust. Thumbscrews permit quick adjustment of both the deflectors illustrated.

HUB-TIRED WHEEL FOR AUTO DESIGNED BY INVENTOR

Instead of placing pneumatic tires on the rims of automobile wheels, a Baltimore inventor advocates putting them



A Pneumatic Tire Fits on the Hub of This Novel Automobile Wheel, Instead of on the Rim, As Is Customary. A Steel Guard Relieves the Tire of Side Strains

on the hub. He has constructed a wheel which allows this to be done and declares it to have proved satisfactory. In this the hub is somewhat enlarged and carries a small inflated tire. Surrounding the tire is a grooved steel ring, from which the spokes radiate. Bolted to the hub is a plate, shaped to receive the side of the tire, and covering the tire and the edge of the ring. This is designed to relieve the tire of side strains. The rim of the wheel is fitted with a solid composition tire. A record of 43,000 miles of travel has been made by one such wheel.

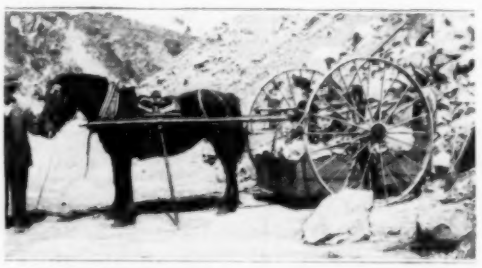
ACROBATIC CYCLIST THRILLS CALIFORNIA BEACH CROWD

Thrilling the public of this age is a task requiring not only daring, but originality and skill as well, so accustomed have people become to witnessing hazardous feats. Among the reckless performers who have succeeded in eliciting gasps from modern crowds is an acrobatic motorcyclist who recently roused spectators on a California beach with an unusual act. Balancing his machine and its attached sidecar on the two wheels of the former, he stood on the frame of his cycle and drove at a speed of 25 miles an hour over the sand, controlling the motor with his left foot and right hand. A passenger standing in the sidecar made the feat more difficult and spectacular.

Something New to Thrill the Public: This Daring Motorcyclist Furnished Entertainment for a California Beach Crowd

HIGH-WHEELED QUARRY CART CONVEYS HEAVY LOADS

Because of its high wheels and low center of gravity, a slip-jack cart, used in a western stone quarry for hauling rocks to a crusher, can be drawn over uneven ground by a single horse, even if loaded to its capacity of two tons. Suspended between the wheels of the con-

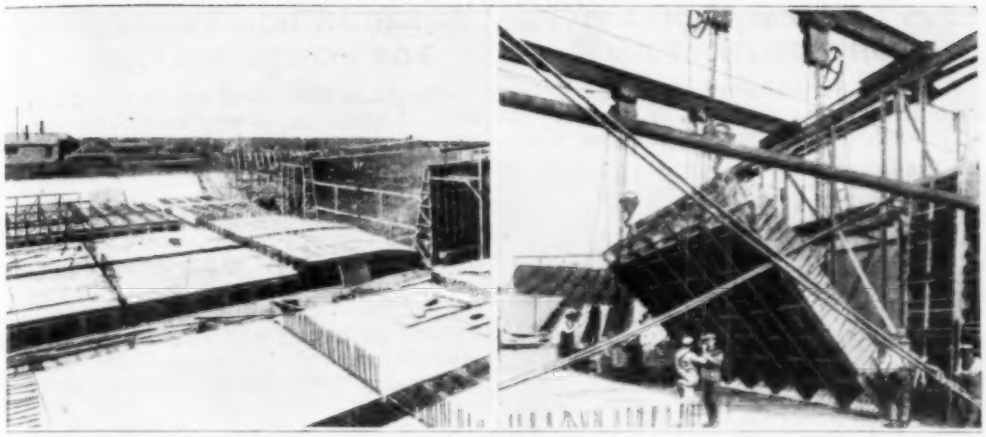


A Single Horse can Draw a Load of Two Tons in This High-Wheeled Slip-Jack Cart, Which is Used in a Western Stone Quarry

veyance, the skip may be lowered to the ground for loading, and raised a few inches by a crank-operated windlass when it is desired to move the cart. At the rear is a long lever which is used to dump rock from the skip through a trapdoor into the crusher. When the cart is standing still, the horse is relieved of the weight of the load by a shaft support.

STRANDED STEAMER FLOATED BY EMPTY BARRELS

Empty barrels placed in the punctured hold of a steamer stranded recently on the rocks in Bristol Channel increased the buoyancy of the vessel to such an extent that it was floated without difficulty. The salvaging was accomplished on the high spring tide, after repeated attempts to rescue the ship by other means had failed.



PHOTOS BY COURTESY OF THE ENGINEER, LONDON

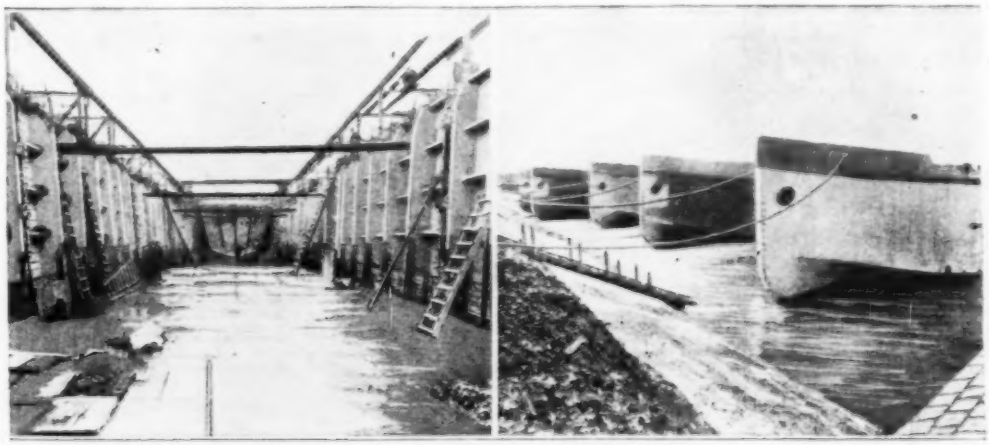
The Ship's Sides are Made by Casting the Concrete Flat, as Seen in the Left Picture. The Method of Hoisting These Flat Sides into Place on the Ship, After They have Set, is Clearly Indicated in the View at the Right, Which Also Shows the Size of the Sections

CONCRETE-SHIP SIDES BUILT IN FLAT PRECAST UNITS

By reverting, in effect, to the primitive conception of a ship as a floating box, British engineers have been able to make some decided improvements in concrete-ship construction, as applied to a fleet of five colliers just completed. The novel feature of the system used lies in casting the ship's sides in horizontal units, 3½ in. thick, which, after the concrete has set, are raised to their final position, the joints occurring only at bulkhead lines. Bow and stern, being curved, are cast in place in the ordinary manner, with a thickness of 5 in. The flat bottom is molded after the sides are completed, and it is interesting to note that women are employed to construct the reinforcing network. The colliers are 185 ft. long, 35 ft. beam, and 18 ft. deep, with perfectly square lines except at bow and stern.

PHYSICIAN PROPOSES PLAN FOR JUDGING HOSPITALS

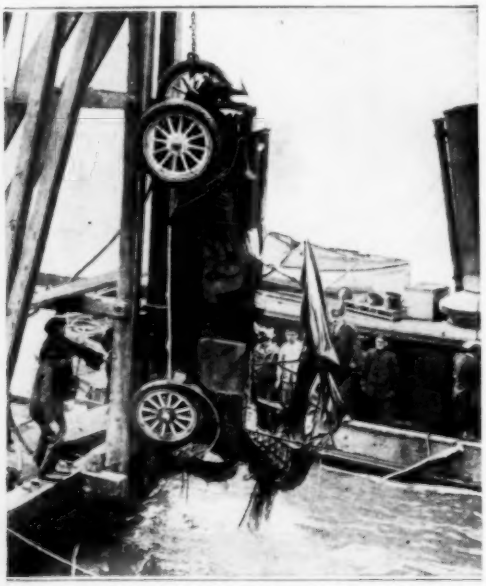
Hospitals will be classified according to their merits for the information of the public, if a standardization plan proposed recently by a medical authority is put into operation. It is said that institutions of this kind vary considerably as to facilities, and that while the service of some is good, others surpass in diagnosis and treatment. Classification would result in general improvement by creating a standard.



The Floor, or Bottom, of the Ship is Formed After the Sides have been Hoisted into Place, the Interior Then Appearing as at the Left. The Right Picture Is of the Completed Fleet of Five Concrete Colliers as They Looked Just after Launching

HEAVY CAR BACKS INTO RIVER FROM FERRYBOAT DECK

Just as a ferryboat crossing the Delaware River from Camden, N. J., docked at its Philadelphia wharf, a short time



Hoisting Out of the Delaware River the Seven-Passenger Car That Backed Off a Philadelphia Ferryboat into 18 Feet of Water

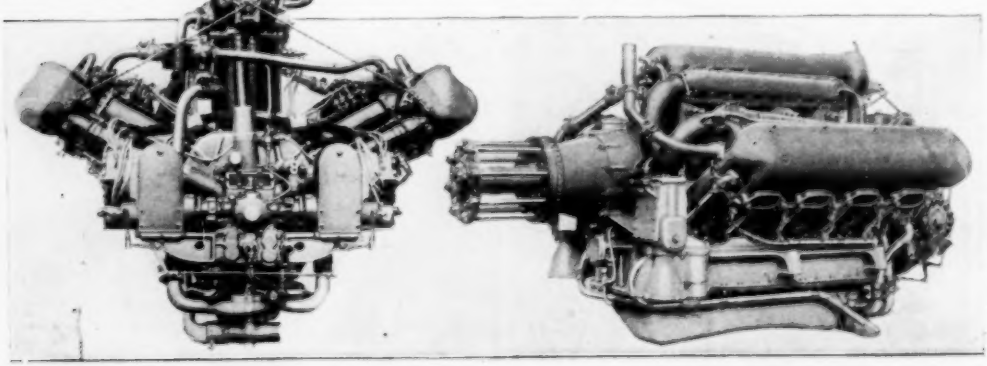
ago, a big seven-passenger auto, the last one on board, suddenly backed off the deck into 18 ft. of water. Only five of the eight persons occupying the car were rescued. After divers had fastened tackle to its front axle, the sunken auto was hoisted out with a derrick. Immediate examination showed that the gears were in reverse, and the switch on, a condition which was not explained.

AMERICAN HOUSING METHODS FOR REBUILDING FRANCE

France, in its task of restoration of devastated territory, is confronted by much the same housing problem now that was successfully solved by industries in this country during the war. The manner in which the situation was met at Hog Island and similar projects, where individual dwellings for great numbers of families were required on short order, is being studied by a visiting commission of French architects and engineers. These modern methods of group construction are equally applicable to reconstruction.

LIGHTWEIGHT NAPIER TWELVE SHOWS NOVELTIES IN DESIGN

The 12-cylinder, 450-hp. Napier aero engine is one of the most successful examples of the "broad arrow" method of cylinder arrangement, involving three sets of four each. Every cylinder has two inlet and two exhaust valves, operated by overhead cam shafts. The connecting rods of only the four vertical cylinders act directly on the crankshaft, the auxiliary rods in right and left-hand cylinders being hinged to the central rods. The fireproof disposition of the carburetors is noteworthy also. As there are three separate air intakes, one cylinder block may back-fire without disturbing the other two, which will continue to run, thus sucking in the flames. The engine is something of a novelty, too, in having a separate water jacket for each cylinder instead of a multiple jacket for each block of four cylinders. The weight per horsepower is only 1.89 pounds, including a reduction gear.



Many of Britain's Most Successful Airplanes have been Motored with This Compact Power Plant, Known as the "Napier 12." The Weight, Including Reduction Gear, Is Only 1.89 Pounds per Horsepower. The Cylinders are Arranged in Three Sets of Four Each

Only the Stability Contributed by a Cargo of Several Hundred Pounds of Halibut Keeps the Dory Right Side Up as the Unconcerned Fishermen Bring It to the Lee Side of the Schooner in a Smother of Heavy Seas, into Which a Single Error in Handling the Small Boat would Precipitate Them Bodily

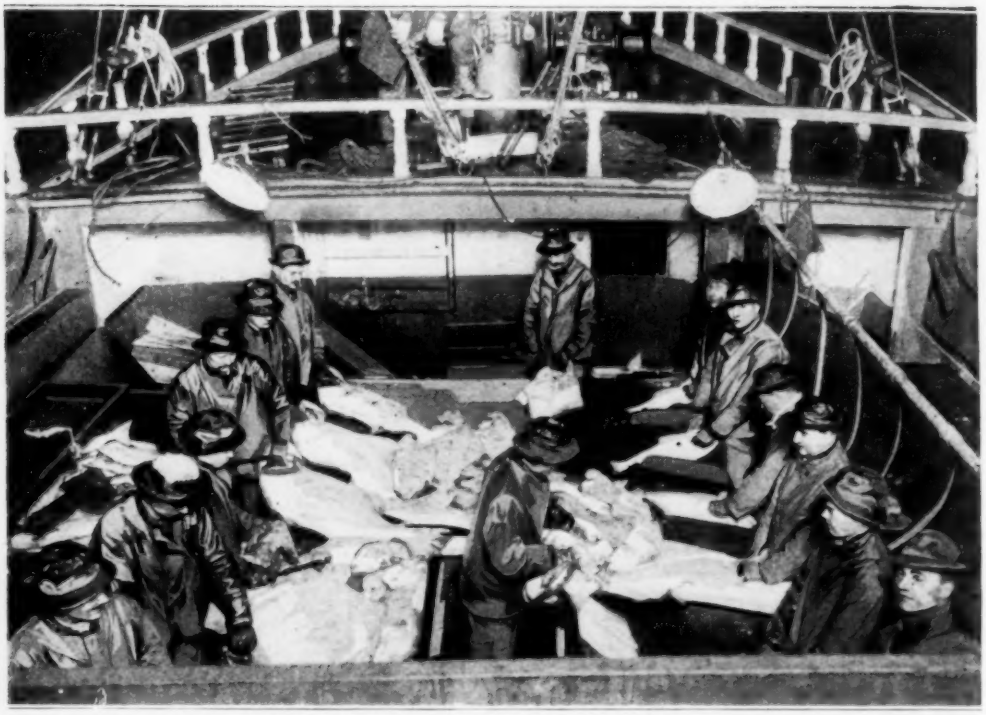
THE LURE OF THE NORTH PACIFIC

By LAWRENCE WILLIAM PEDROSE

THE cod fisher of the Newfoundland banks, the trawler of Grimsby, have been immortalized in song and prose, but little has been told of the "halibutter," the fearless fisherman of the north Pacific who often fares up into the shadow of the Arctic to harvest old banks or to search for new ones.

The life of the halibut fisherman is one of chance and of hardiness. No voyage is too long, no passage too dangerous for him to navigate, in what may seem to landlubbers like a little toy ship built for the sheltered waters of some bay or inlet and equipped with still smaller toy dories. Mountainous waves may race before the wind and angry reefs may rear their heads above the surface, but the tiny auxiliary schooners of the halibutters mind not the danger, because they are masters of it usually. The halibutters are a sturdy lot—the captains of the boats usually members of the old seafaring school; each of the crew typical of the real navigator, able, fearless. The lure which draws the prospector, the "pot at the end of the rainbow," holds the halibutter to the sea. The daily thrills, the fascination of the game with death he plays, are calls which he cannot resist. Like the lumberjack, who is always going to quit the woods when he makes a stake, the sailor who is always going to quit the sea next voyage, and the prospector who is always going to quit the hills when he makes a strike, the halibutter always swears off when he has made a successful trip—and invariably goes back.

The Schooner, under Both Canvas and Engines, Drives Homeward at Racing Speed, and the Danger-Loving Sailors Take Advantage of the Opportunity to Do a Little Surf Riding in the Flat-Bottom Dories, Which Skim the Seas Like Hydroplanes



Work does Not End with Daylight by Any Means, For the Day's Catch is Still to be Dressed Down, a Task in Which All Hands Join Except the Captain. When the Seas are Running High, It Is Something of a Trick to Clean a Slippery 75-Pound Fish and Get It Below with Speed and Celerity

The cruise of the halibut boat may extend from three weeks to as many months, depending on the distance to the banks, which are selected according to season. The boats are worked by shares —one-third to the boat, two-thirds to the crew of from six to eighteen men, including the cook. The owner of the craft usually is its master. It is not an uncommon thing for a boat to return from a cruise with 90,000 to 125,000 lb. of fresh halibut stored away on ice in its holds. This brings a market price of from 12 to 18 cents a pound at the docks, netting the owner of the lucky boat about $6,000, and the crew approximately $1,000 apiece for three months' work.

One Man Gaffs and Kills the Fish While the Other Tends the Line, Which Runs over a Pulley

INVESTIGATION OF FARMING ENCOURAGED BY BRITAIN

Agricultural research work in England will be encouraged by the use of an appropriation of $10,000,000 recently made by the British government. Farming problems are now being investigated by not more than 40 men in England and Wales. It is hoped to increase this number to 150 during the next few years. Scholarships, and other inducements, will be offered to those showing aptitude for the work, and measures will be taken to bring to the notice of farmers the value of scientific methods.

PANAMA CANAL AIR DEFENSES BEING PLANNED BY ARMY

Air defenses for the Panama Canal will be planned after the report of a military board, now investigating on the isthmus, has been received. Instructions given to the board indicate that the War Department intends to place several defensive aerial units in the Canal Zone, besides four balloon companies to assist the coast artillery in adjusting fire. The number of aerial units necessary and the best sites for their stations will be decided by the board, which also will consider other questions relating to the protection of the canal.

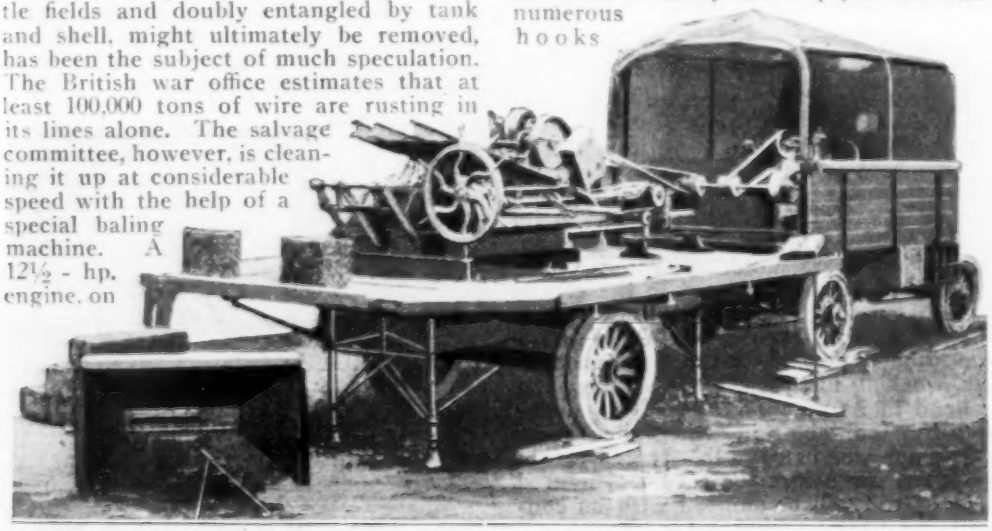
RAILROAD STOPS OIL WASTE WITH PITS BENEATH TRACKS

More or less oil is slopped over each time the tanks of an oil-burning locomotive are filled. The loss is small in the case of a single locomotive, but becomes considerable when repeated thousands of times each month. So, one railroad has built pits beneath the tracks at all refilling stations. The overflow falls into the pit, from which it is drawn at intervals for reuse. The saving of oil from the pit in the illustration is said to amount to 25 bbl. a month. With oil at $1.50 a barrel, and hundreds of these pits in use, the total saving is a big one.

This Pit Collects the Crude Oil Which is Slopped Over in Filling the Tanks of an Oil-Burning Locomotive. It Conserves Much Oil That was Formerly Wasted

BALING MACHINE SALVAGES BARBED WIRE

How the vast system of barbed wire that has been pounded into Europe's battle fields and doubly entangled by tank and shell, might ultimately be removed, has been the subject of much speculation. The British war office estimates that at least 100,000 tons of wire are rusting in its lines alone. The salvage committee, however, is cleaning it up at considerable speed with the help of a special baling machine. A 12½-hp. engine, on a motor truck, operates the machine on a trailer. A heavy wire rope, armed with numerous hooks

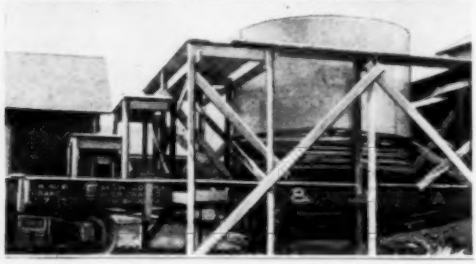


The Baling Machine on the Trailer, Driven by an Engine in the Truck, Draws In the Tangled Barbed Wire with Hooked Cables, and Compresses It into Compact Cubes Like Those Seen at the Rear of the Platform

drags the barbed wire through two sets of rollers, which reduce the mass first to 48 by 48 by 12 in., and then to 48 by 12 by 12 in. A powerful ram then crushes the bundle into a compact cube of 12 in., weighing 70 or 80 lb. The first machine used in the field made 32 cubes in an hour.

WISCONSIN FACTORIES MAKE WORLD'S LARGEST CHEESE

Facts and figures relating to an enormous cheese recently made in a Wisconsin city support the claim of its manufacturers that it is the largest of its kind in the world. Weighing 31,964 lb., the cheese is 8 ft. high and 10 ft. in diameter. It is valued at $16,000. Twelve thousand cows, grazed on 1,800 dairy farms, furnished the 357,000 lb. of milk used in its making. To coagulate this milk, 1,215 oz. of rennet were used. Eight hundred pounds of salt were placed in the cheese as seasoning. Two cloths, each 33 ft. long and 16 ft. wide, were used to swath the product. Seventy-three cheesemakers, working in 59 different factories, had a hand in its manufacture. The galvanized-iron container in which the cheese was made weighs 8,000 lb. It was placed on a flat car before the curd was poured into it, and will be shipped with its contents to Chicago, where the cheese will be exhibited at a dairy show.



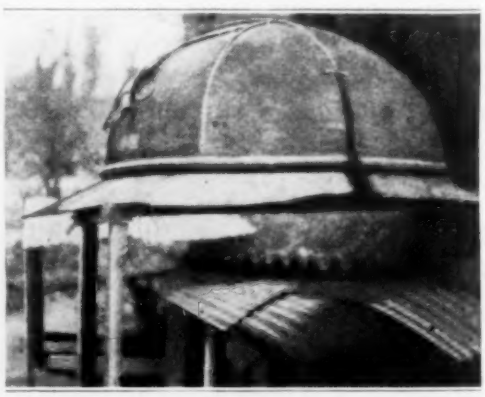
Making the World's Largest Cheese: Above, Cheesemakers Pouring Curd into the Huge Vat; Below, a View of the Container Mounted on a Flat Car

AERIAL OBSERVERS ADJUST FIRE OF BIG COAST GUNS

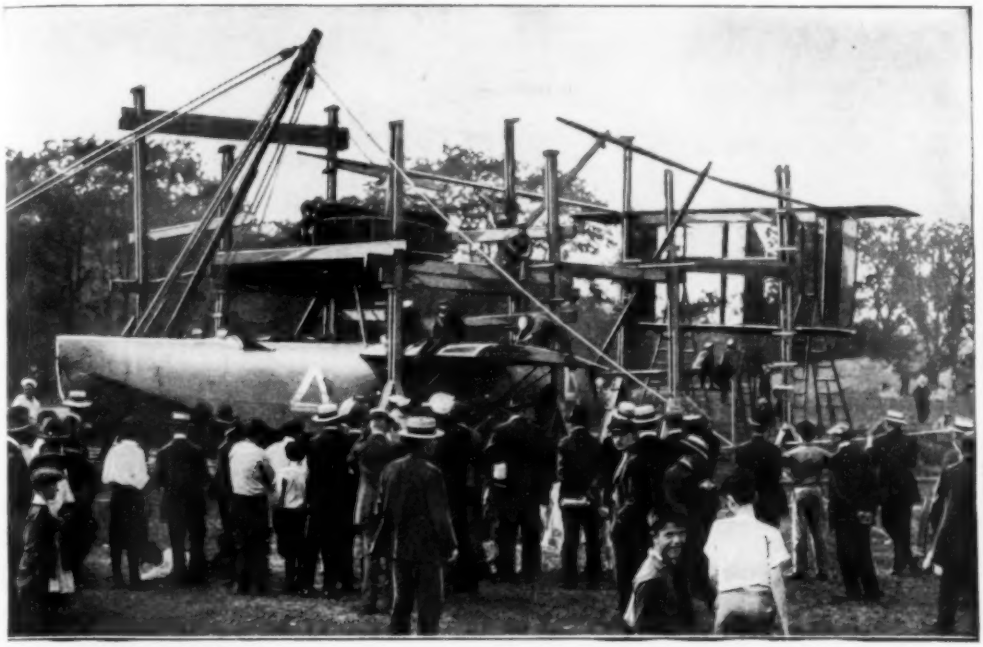
American aerial observers have developed remarkable precision in the adjustment of fire from the field guns and heavy artillery. It is only recently, however, that army observers have conducted "shoots" for the big coast-defense guns. Absence of reference points, difficulty in orientation, and other obstacles have embarrassed the airmen while spotting shots many miles out at sea. Experiments on these new problems of coöperation between airplane and shore battery have nevertheless been under way for several months along the eastern coast. A successful "shoot" was staged at Fort Hancock, N. J., a few weeks ago. Twelve-inch projectiles were hurled at a target 15 miles from shore. The directing airplane cruised at 4,000 ft. and was able to guide the fire with such accuracy that a "bracket" was obtained in less than 13 shots, a target being "bracketed" when one shot falls over and one short. A battleship in the position of the target would have been destroyed.

HUGE HELMETS ARE ROOFS FOR DUGOUT PORCHES

Strictly military in design are the porch roofs made by French soldiers during the dull days of the armistice period and placed at the entrances of their dugouts along the Soissons-Reims road. Shaped like trench helmets, the roofs are several feet across and complete in all details, even to the insigne on the front of the crown. They are supported in front of the dugout doors by posts.



Huge Helmets Serve as Porch Roofs in Front of Dugouts along the Soissons-Reims Road. They were Made by French Soldiers



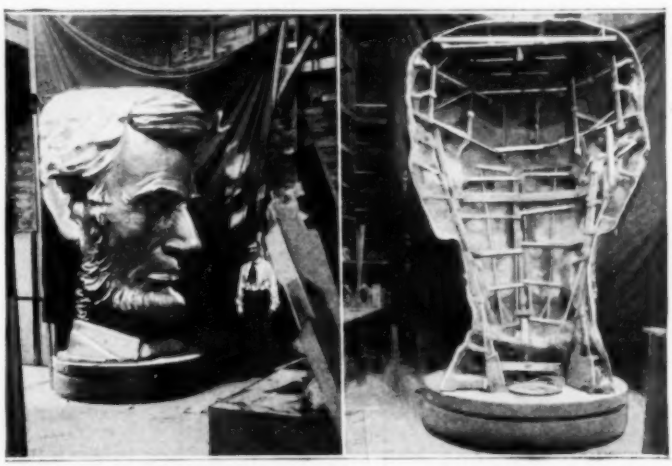
COPYRIGHT, PRESS ILLUSTRATING SERVICE

NAVY'S TRANSATLANTIC SEAPLANE DISPLAYED IN CITY PARK

THE seaplane "NC-4," veteran of the world's first transatlantic air journey, is home again. The ship was dismantled at Plymouth, England, and returned to the United States in the hold of a navy vessel. Arriving at New York City, it was transported to Central Park, and there reassembled on orders of the Secretary of the Navy. Interested crowds gathered during the reconstruction and the week of its stay, drawn by a feeling for the romance which will cling forever to the ship and its story.

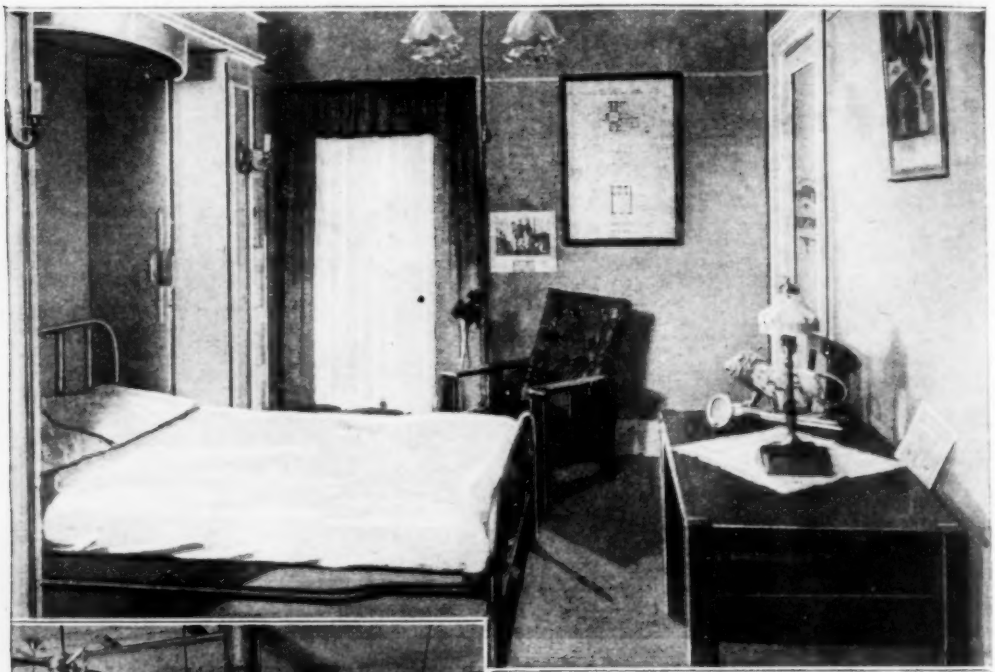
SCULPTURED HEAD OF LINCOLN STANDS ELEVEN FEET HIGH

Though the head of Abraham Lincoln has been modeled and sculptured in all imaginable sizes and expressions, the recently completed work of an artist in Tacoma, Wash., easily takes first place for sheer bigness, if nothing else. The finished head, of bronzed plaster, will be 11 ft. high. It is hollow, and braced within by a timber frame; but the clay model from which the plaster was cast was solid, and weighed 40,000 lb. While the artist worked on the upper portions, an assistant threw the clay up to him in handfuls, which were pounded into place with mallet and fist. The hair of the forelock was modeled with a shovel, and the lips so molded that one side of the face appears sad and the other joyous. The head, though as yet without a back, is being exhibited in various west-coast cities.

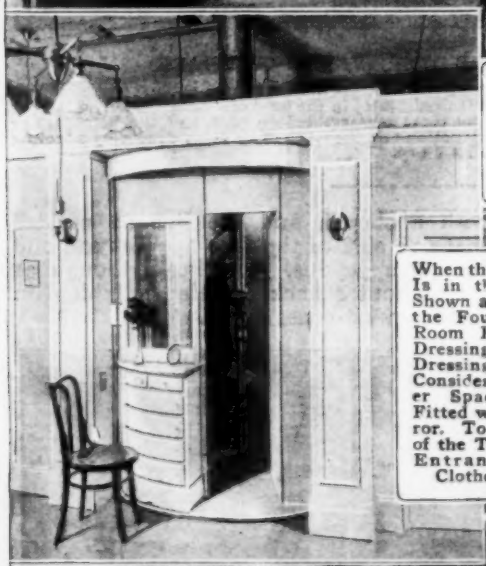


Modeled by an Artist of Tacoma, Washington, This Enormous Sculptured Head of Abraham Lincoln is Believed to Be the Largest Likeness of Its Kind of the Great Emancipator. On the Right Is a View of the Work from the Rear, Showing the Framework

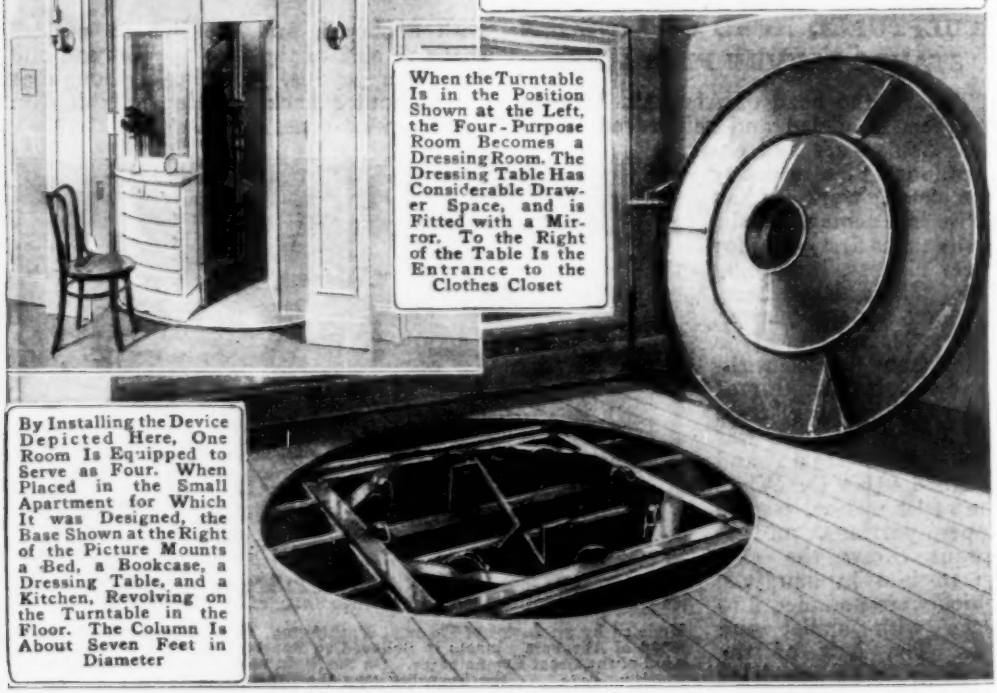
ALL CONVENIENCES OF FOUR-ROOM APARTMENT



One Phase of the Quadruple-Service Room: In This Case It has been Transformed into a Sleeping Apartment by Pulling the Bed Out of Its Recess in the Revolving Column That Carries All the Conveniences of a Four-Room Flat. The Installation is Intended to Assist in Solving the Housing Problem in Congested Cities



When the Turntable Is in the Position Shown at the Left, the Four-Purpose Room Becomes a Dressing Room. The Dressing Table Has Considerable Drawer Space, and is Fitted with a Mirror. To the Right of the Table Is the Entrance to the Clothes Closet

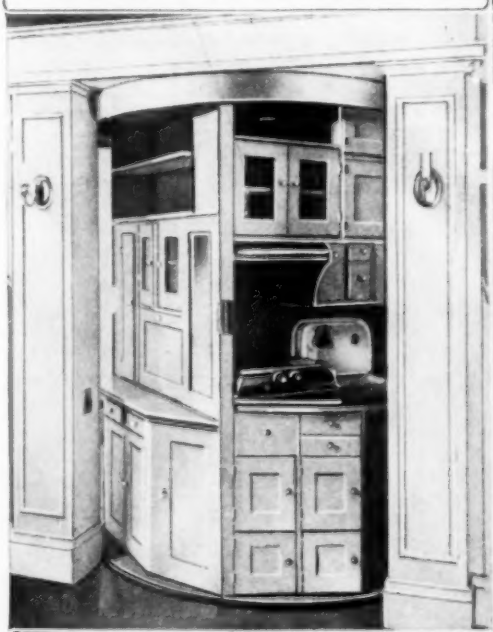


By Installing the Device Depicted Here, One Room Is Equipped to Serve as Four. When Placed in the Small Apartment for Which It was Designed, the Base Shown at the Right of the Picture Mounts a Bed, a Bookcase, a Dressing Table, and a Kitchen, Revolving on the Turntable in the Floor. The Column Is About Seven Feet in Diameter

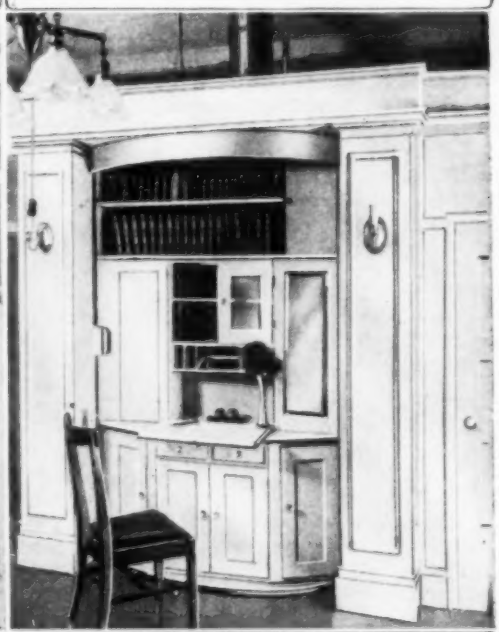
PROVIDED IN CONDENSED FORM BY TURNTABLE

Here Is the Compact Little Kitchen That is Brought into the Room by Revolving the Platform on Which It Stands. Its Convenient Arrangement can be Seen by a Glance at the Illustration. Cooking Fumes are Carried Away by a Ventilating Duct Connected with the Hood over the Stove

This Picture Shows the Dressing Table Nearly in the Proper Position for Use, with the Bed Disappearing from View as the Carrier Turns. At the Left, beyond the Bed, is Seen the Hall of the Apartment, and the Entrance to the Clothes Closet is Coming into View on the Right



In This Position the Versatile Turntable Exposes Both the Kitchen and the Combination Writing Desk and Bookcase. Turning the Device in One Direction Brings into Position the Means for Cooking a Meal, and Turning It in the Other Makes Books and Writing Material Accessible



One of the Numerous Doors of the Writing Desk is Hinged So That It will Drop Down and Provide a Proper Surface for Writing. When the Occupants of the Four-in-One Apartment Desire to Convert It into a Library, They Turn the Revolving Column into the Position Shown Here

BY COURTESY OF PASQUALE L. CIMINI

MOTOR BUS RECEIVES RADIO MESSAGES AS IT TRAVELS

Ocean-going steamships are not the only conveyances privileged to maintain radio communication with the rest of the world as they move along their courses. A motor bus running from London to Colchester, England, was provided recently with a wireless receiving antenna, consisting of a coil of wire on a rectangular wood frame, mounted on the side of the body. Passengers of local prominence were supplied with head telephone receivers connected to the wire, and as the bus bowled along the highway they listened to speeches and music whose clearness was unimpaired by their aerial flight. The transmitting station was a temporary field installation of the military type.

The Rectangular Wooden Frame on the Side of the Bus Carries the Wire Coil That Serves as Antenna to Collect Radio Messages as the Car Moves along. The Passengers are Seen Listening to Speeches and Music

AIRPLANES SURVEY FORESTS TO VALUE WOOD PULP

Four airplanes are being used to survey the extensive forests of Labrador to determine the value of the wood pulp represented by the growing trees. Aerial photographs will be taken of many parts of the peninsula for use in compiling statistics. The surveying party, which left the United States recently for Nova Scotia, is composed of 40 persons and is headed by a man who served two years as a captain in the British air forces.

SHELLS CLEAR BIG TIMBER FROM RUSSIAN FARM LANDS

From Russia comes another story of American ingenuity solving native perplexities. In Petrograd were stored great numbers of large-caliber shells, intended for German foes, but quite superfluous in the playful skirmishings of revolutionist and counter-revolutionist. In the woodland domains, once the property of the crown but now appropriated for peasant farms, stood huge trees, too large and too numerous for removal by ordinary means. An American newspaper correspondent entered at this point with the suggestion that the shells be brought to the trees. His suggestion was followed. With a little knowledge of American methods he showed the peasants how to bury the shell at the base of the tree, how to connect wires to a distant switch, and how to explode the charge which uprooted the tree. The system is now reported to be in general use, clearing large areas for peaceful cultivation.

COMFORTABLE MOBILE HOUSE BUILT ON TRUCK CHASSIS

Few of the conveniences of a stationary dwelling are missing from the comfortable house built on a truck chassis by a nomadic eastern man, who, with his family, is touring the country in his motorized living quarters minus the usual hardships. The special body is 18 ft. long, 7½ ft. wide, and 7 ft. high, and has a porch, 7½ ft. square, hinged on at the rear. When the porch is let down and supported on a level by attached legs, the mobile home has a length of nearly 26 ft. A roof over the porch gives protection from sun and rain, while awnings can be lowered on the three sides of the veranda to make of it a canvas-walled room. Inserted in the awnings are windows of mosquito netting, which admit air, but exclude insects. Inside the body are sleeping accommodations for seven persons, and a complete kitchen, includ-

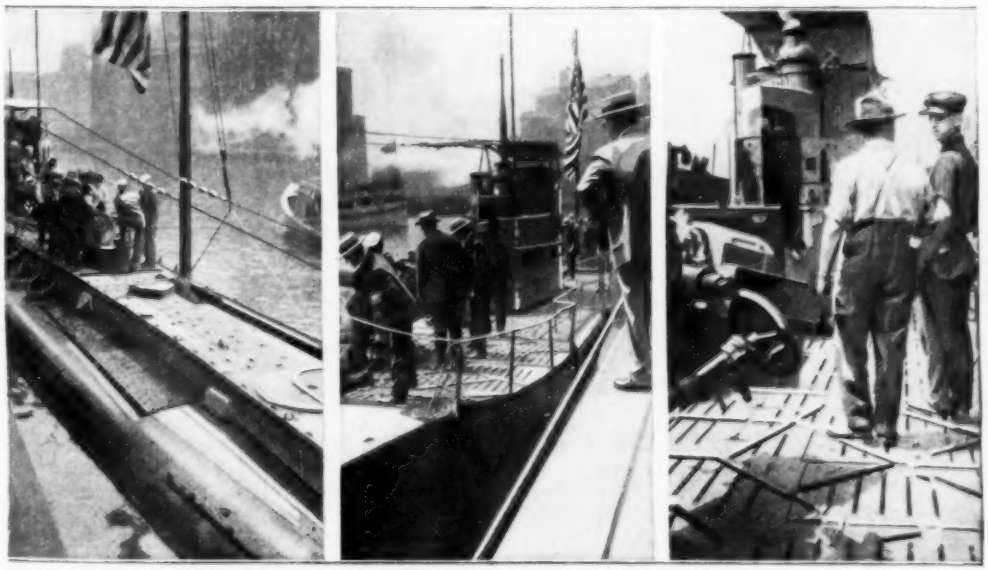
A Comfortable, Roomy Home on Wheels, Built by an Eastern Man Who Likes to Tour, but Dislikes the Usual Hardships: Inside Are Sleeping Accommodations for Seven Persons, a Complete Kitchen, and Other Conveniences

ing a refrigerator, an oil stove, and a fireless cooker. There also is a wash room and toilet. On the roof is carried a canoe, for use when a stop is made near some body of water, and a phonograph provides indoor entertainment.

Two courses in spoken Chinese are included in the summer curriculum of Columbia University.

U-BOAT VISITS LAKE CITIES IN RECRUITING CAMPAIGN

Germany's U-boats failed to win the war, so a number of them are now winning men for the U. S. Navy. A typical recruiting visit was paid to Buffalo, N. Y., by the "UC-97" not long ago. Crowds thronged to the harbor, curious to see the humbled monster. A few at a time,



A Submarine, Formerly of the German Navy, Lately Journeyed on a Recruiting Mission to Buffalo, New York. Curious Visitors are being Shown the Bow and Stern Hatchways in the Two Left-Hand Photographs. At the Right is Seen the Bridge, Still Adorned with the Imperial German Crest in Yellow and Black

they were allowed to descend the gangplank to inspect the deck and conning tower. On top of the bow is seen the huge saw teeth intended to cut through the nets before allied harbors. Deck gun and mast may be withdrawn in 50 seconds. The insigne of the once-imperial German government is still displayed on the conning tower. Official "credit" is given the "UC-97" for sinking seven allied vessels, which are thought to be represented by a harp, a pair of scales, and other strange symbols on the sides.

SMALL THREE-WHEELED AUTO DESIGNED FOR CHILDREN

A tiny automobile of the most unusual simplicity has been designed and built for use by the youngsters. The original car is a three-wheeled vehicle, steered by the front wheel and driven by the two in rear. Full elliptical springs

In This Little Three-Wheeled Motor Car the Automobile has been Reduced to Its Lowest Terms. A Single-Cylinder, Two-Cycle Engine is Mounted on the Axle

on the driving wheels and a coil spring in front absorb shocks, and are intended to serve also instead of pneumatic tires. Power is furnished by an electric motor and storage cell, or, if preferred, by a gasoline engine. The single-cylinder, two-cycle engine used in the original car is of special design, driving the rear wheels directly from the crankshaft. The inventor hopes to dispense with differential gears and other bothersome features in this way and plans to market his machines at $100 or less.

POSTMARK ADVERTISING USED FOR NATION'S FORESTS

Advertising national forests as vacation resorts is being done by the Forestry Service Bureau through the use of postmarks. Post offices in southern California, near the Cleveland National Forest, are assisting in the campaign by using two such marks, one suggesting the reservations as places for spending vacations, and the other making an appeal for assistance in preventing forest fires. It is planned to use similar marks in all post offices located near national forests.

COMPETITION WILL ESTABLISH COST OF COMMERCIAL FLYING

A great airplane "economy run," the first of its kind, will shortly be held in France to answer questions of vital interest to the profession. At the end of a long journey the contesting machines will be examined and graded for security, comfort, speed, lifting power, and cost of transport per ton-mile. Thus the much-debated financial possibilities of commercial aviation will be clarified, and air-craft producers and the business world will learn more exactly what it costs to fly. The competition is open to all allied machines carrying four or more passengers. Among the contestants will be distributed a first prize of $20,000, and six others varying from $15,000 to $1,000. The course runs south from Paris to northern Spain, to northern Italy, thence back through France, Switzerland, and Belgium to London, and to Paris again.

VOLTAGE REGULATOR ALLOWS UNIVERSAL USE OF FAN

Equipped with a compact transformer that handles currents varying in force from six to 110 volts, a small electric fan, carried by a salesman who travels in the state of California by motorcycle, is used by him wherever he goes. The transformer is contained in the back of the felt-lined case in which the fan is packed. Manipulating a multi-pointed switch on the transformer regulates the voltage of current supplied to the fan motor. Attached to the storage battery of the motorcycle, the fan is used to cool the engine while repairs are being made to the machine. It runs equally well on the 35-volt current used for lighting sleeping cars and the 110-volt circuit in hotels.

ON THE TRAIL of the "HARD STUFF"

By E. T. BRONSDON

ACCORDING to some of the less scrupulous "wet" propagandists, and even in accord with the arguments of a few of the most ardent advocates of the Death Valley brand of prohibition, the little brown jug now is going to have no place wherein to lay its cork. A new breed of dogs is to be trained; these are to be known as C_2H_5OH hounds. One of them will be able to smell a drop of whisky through four inches of bessemer plate lined with asbestos, and track it unerringly to its lair.

Each country district and each municipality will own one of these sharp-nosed creatures. The second hard liquor is brought in or distilled near at hand, the dog will go "a-rarin'" after it. Search and seizure will follow, of course.

Officers who will have charge of the enforcement of the new amendment doubtless wish some breeder would invent this animal immediately. Though no move is to be made under the present law against stores of liquor resting innocently in the basements of their respective owners, illicit distilling or illicit sale now is a serious offense and must be detected and punished, else "blind pigs" will make a joke of the constitution of the United States.

"Covered completely by dough and crust, the bottle never would have been detected had not his driver crossed the wires on one delivery and left whisky loaves at the homes of unsuspecting customers who really wanted bread."

Federal officers have a task before them in this. The Yankee is an inventive chap, even when he turns to lawbreaking. Though it is to be deplored, it remains a fact that as long as there exists a widespread demand for intoxicating beverages in this country, men are going to attempt to satisfy that demand. Some distilling will go on. A great deal of transportation and sale of liquor, already distilled against the drought, will be attempted despite the prison term and heavy fine which await the offender who is caught.

Officers who have this branch of endeavor to watch recently have been examining the possible means that will be used for the transportation of liquor stores. In obtaining these data they have gone to the files in what previously has been dry territory—states that put their feet on the neck of the Demon Rum in the days when a majority of the assemblage of states still was problematical. The means and methods employed by booze runners in the past are as interesting as the schemes for getting negro slaves to the "underground railway" in the days before the Civil War, and are extremely pertinent in the present.

Loaves of bread that are shipped from wet into dry territory always are suspicious; probably now every loaf that is baked and distributed for sale will have to pass the inspection of a C_2H_5OH hound.

The reason for this lies in the enter-

prise of a southern baker, who recently was found to be shipping liquor into prohibition territory. His bakery was near the state line, and many of his deliveries were made in the adjoining Sahara. For no apparent reason his export trade began to boom. After a few weeks he was selling five times as many loaves of bread across the line as he sold in his own county!

One day the secret came out. Into many of the loaves he delivered across the line he baked a good-sized flask of "mountain dew." Covered completely by dough and crust, the bottle never would have been detected had not his driver crossed the wires on one delivery and left whisky loaves at the homes of unsuspecting customers who really wanted bread.

Automobiles carrying a large number of spare tires will probably fall under suspicion shortly. It has been found to be such an easy solution of the problem, when going on a fishing trip or when replenishing the depleted stores of a "blind pig," simply to place tin inner tubes in three or four tire casings, fill the receptacles with high-proof, and buzz merrily along to the destination. Out in Oklahoma all the Fords carried a complete change of tires for a time, without the finger of suspicion pointing. When a few, dissatisfied with the capacity of a flivver tire, started strapping on 37 by 6-in. truck tires for spares, the game was off.

Another auto method that enjoyed some popularity was that of carrying either two gas tanks, or placing a false tank in the center of the true gasoline tank. The latter was not as satisfactory as the first, because both gasoline and liquor were strictly limited in quantity; the car could not make a long trip on little gasoline, nor could it be illegitimately profitable on a small volume of whisky.

The first plan had much in its favor. Until lately many cars were made with the gas tank under the seat. Now almost all, except a few of the smallest, carry it in the rear. A second tank under the driver's seat can be fitted up with ease, however, and it is extremely hard to detect. Even if one sees the liquor tank it is hard to remember that cars aren't made that way any more. Nine out of ten persons would pass it by without a thought of booze-running; in that it has much of a lead over the spare-tire plan.

A certain Canadian distillery, with headquarters on the Detroit River, found means for delivering liquor in dry territory in a volume impossible to persons employing the more ordinary smuggling devices. Because of its location, directly across the river from the dry state of Michigan, because of the small volume of business transacted, and because of the apparent prosperity of the place, officers watched for a long time. Even then detection did not come until a lucky accident happened.

While dragging the river for the body of a drowned man, the authorities pulled up a length of pipe from the bed. This pipe led directly from the distillery to a dry-goods warehouse on the Detroit side. Needless to state, practically the whole of the liquor product of the distillery was sent to Michigan in the pipe as quickly as it was made.

Furniture bound for the state of Maine

"Out in Oklahoma all the Fords carried a complete change of tires for a time. . . . When a few, dissatisfied with the capacity of a flivver tire, started strapping on 37 by 6-in. truck tires for spares, the game was off."

"While dragging the river for the body of a drowned man, the authorities pulled up a length of pipe from the bed. This pipe led directly from the distillery to a dry-goods warehouse on the Detroit side. Needless to state, practically the whole of the liquor product of the distillery was sent to Michigan in the pipe as quickly as it was made."

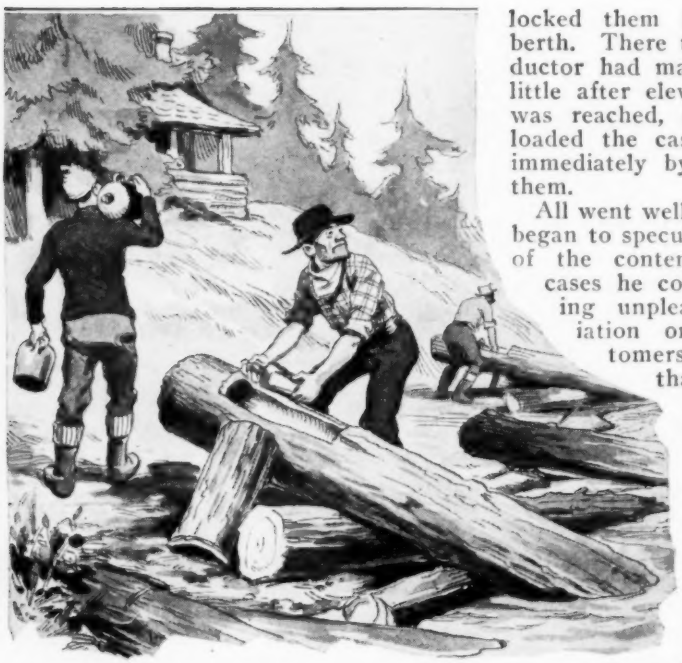
used to incur the gravest suspicion in the days when all the neighboring states were rivals in the trade of keeping her inhabitants supplied in spite of the law. Hollow wooden pedestals, loaded with booze, were mixed with shipments of solid mahogany, oak, and walnut, and were enjoyed to the limit by the consignee. In shipping furniture, the various parts of large pieces ordinarily are shipped separate; to keep the weights of the rum-laden legs and pedestals from seeming out of the ordinary, two hollow pedestals were crated together, thus approximating the total weight of two solid pedestals. Often the same containers were used over and over again, the consignee returning the emptied furniture as a "mistake in style."

This method, as well as the thousands of similar stunts possible with other articles of like nature, probably will be one of the most popular now.

On the two Thanksgiving days and Christmases spent by our boys in camp in this country, many civilian relatives attempted to relieve the monotony for them by sending in fire water disguised in various ways. One of the cleverest of these was exposed at Camp Devens, where real roast turkeys came in with camouflaged stuffing of whisky demi-johns. Many other means of smuggling liquors were tried, such as shipping boots with the lower part loaded, hiding flasks in boxes of candy, and so on; but because of the vigilance of the delivery department, a great many of these were unmasked. On the whole, our boys who served in the army were better taken care of than they could have been in civil life, so far as opportunities for drinking are concerned.

The manner in which smuggling of liquor across national boundaries may be accomplished in some cases is suggested by an experience of a county in the northern peninsula of Michigan. Right across the state line lie the wet counties of Wisconsin.

"Hollow wooden pedestals, loaded with booze, were mixed with shipments of solid mahogany, oak, and walnut, and enjoyed to the limit by the consignee. To keep them from seeming too light, two hollow ones were crated together."



"A lumberman . . . conceived the notion of hollowing out a portion of all the large logs he floated downstream. Before reaching the sawmill each log gave up its valuable cargo, which brought a high price in the forest districts. Fortunately for the officers who will have to watch, the physical boundaries of the United States offer few opportunities for this trick."

A small river, used much for logging purposes in the past, flows through Michigan to empty into Lake Superior. A lumberman, with more ingenuity than consideration for the law, conceived the notion of hollowing out a portion of all the large logs he floated downstream. Before reaching the sawmill each log gave up its valuable cargo, which brought a high price in the forest districts. Fortunately for the officers who will have to watch, the physical boundaries of the United States offer few opportunities for this trick.

Except for the moral weakness of one link, a Missouri liquor dealer established a perfect chain for slipping gallons of "XXX" into Iowa. The weak link was the colored porter on an interstate express train, who acted as middleman.

Each time the train reached a certain Missouri point—to which it came about 9:30 at night—a man on the platform handed the porter two suitcases and a dollar bill. The money was the fee received by the darkey for his services.

Immediately he took in the cases, which were crammed with liquor, and locked them in an unoccupied upper berth. There they stayed until the conductor had made his last round. At a little after eleven, an Iowa way station was reached, and here the porter unloaded the cases; they were taken up immediately by a man who waited for them.

All went well until one night the porter began to speculate concerning how much of the contents of one of the suitcases he could extract without causing unpleasant comment or retaliation on the part of his customers. He tried half a pint; that seemed to go well and made no tremendous impression on the contents, although it livened up his thirst in great style. By the time he was through the next half pint, he was ready to sleep in the upper berth himself. There they found him, a few hours later, dead to the world, and with the booze of one case spilled all around him. Needless to say, the shippers were picked up on the next trip and the suitcase saloon went out of business.

The airplane right now furnishes possibilities in connection with booze-running that are interesting the Federal authorities tremendously. An airman flying from some point in Canada or Mexico with a load of liquor in his machine, can actually make deliveries to points not far removed from the border!

The mechanism for this accomplishment is not vastly different in shape from one of the explosive "pears" used in bombarding German bastions during the war. Each liquor bomb contains from five to ten gallons of booze, and is reinforced and given a piercing point. The latter operates so that when the airman is flying near the ground he can release the "pear" without fear of breaking it and spilling the contents. If it falls on soil it simply penetrates a short distance; the recipient can dig it out with ease. Of course, when a whole cargo of liquor is to be taken to a single point, the carrying is still simpler; the aviator receives it in a separate tank hung in the center of the fuselage, and does not attempt to discharge the liquor until he alights. This demands regular landing

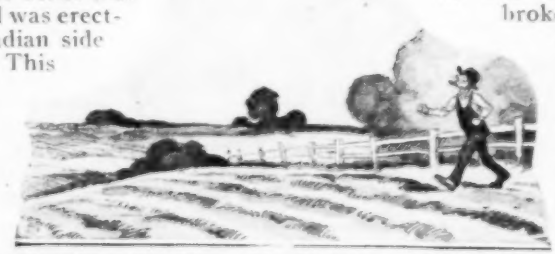
fields or open country well adapted to the taxi requirements of airplanes. Withal, we may look for the development of a whole fleet of liquor smugglers of the air, which will exist until the customs department establishes a regular airplane customs service, with recognized stations at which all incoming machines must stop.

As a comfort to people who see the country sinking into a state of lawlessness because of the open field for liquor smuggling, I wish to predict that no such thing will occur. Clever men may succeed for a time in hoodwinking the law, but even from the beginning it will be both difficult and expensive. As the months go on the difficulty will increase, expense will increase, and demand will drop off. Soon there will not be sufficient reward in the business to counterbalance the risk and expense, and liquor will be as dead as Tiglath-pileser.

If this sounds fishy, look at Detroit. Hundreds of business men in that city believed they could not live without liquor. So strong was this belief that an immense hotel was erected near the Canadian side on a small island. This hotel went up for just one purpose; it was going to house a tremendous week-end booze fight put on the map by thirsty Detroiters.

Did it? Yes, for three months! Then the "thirsty" business men who couldn't live without liquor found that merely going over for the week-end was too expensive and too troublesome. At the end of that time, the roster of guests had dwindled to nothing. The hotel now is closed, and it never will be opened again for the same purpose.

You may count as certain, in spite of the tempest in a teapot that now is going on, that booze has gone for good. It just isn't worth the trouble.



"An airman flying from same point in Canada or Mexico with a load of liquor in his machine, can actualty make deliveries to points not far removed from the border. . . . Each liquor bomb contains from five to ten gallons of booze, and is reinforced and given a piercing point. The latter operates so that when the airman is flying near the ground he can release the "pear" without fear of breaking it and spilling the contents."

PLUNGE OVER CHALK CLIFF SURVIVED BY SOLDIER

Miraculously surviving after a fall of 320 ft. from the edge of a perpendicular chalk cliff, a Canadian soldier whose case has attracted considerable attention has no recollection of the events leading up to his experience, nor of his awful drop through space. The accident occurred near a hospital camp on the coast of France, and was witnessed by a party of French laborers who were at work near the spot where the man struck the beach. When picked up the victim was delirious, but not unconscious. An examination disclosed that his injuries consisted of a slight fracture of the skull, a large wound on the right knee, and several scalp wounds, besides minor bruises on various parts of the body. Remarkably, none of the bones of the legs or arms was broken. After he had recovered the Canadian's mind was perfectly clear on everything in his past life except the events of the night on which he fell over the precipice. Medical authorities are of the opinion that the soldier was mentally unbalanced as a result of having been under condition he wandered unconsciously over the edge of the cliff.

LOCOMOTIVE CRANE LIFTS RAILROAD WATER TANK

Besides being almost indispensable for clearing wreck- blocked tracks, locomotive cranes have been found valuable in other railroad work. In an Ohio town a large water tank was moved recently by one of these powerful machines to a new foundation a short distance from its original location. A chain, attached to the cable of the crane, was looped about the tank, and the crane lifted and swung its load into position without difficulty.

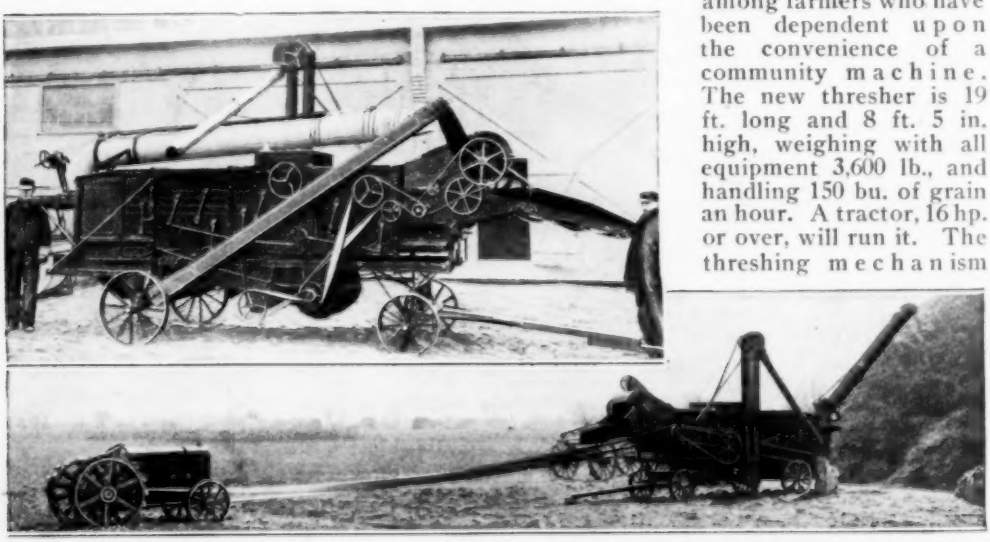
Moving a Heavy Water Tank from an Old to a New Foundation Proved to Be an Easy Task for a Powerful Locomotive Crane

EUROPEAN AIR FIRMS PROPOSE ROUTES FOR SOUTH AMERICA

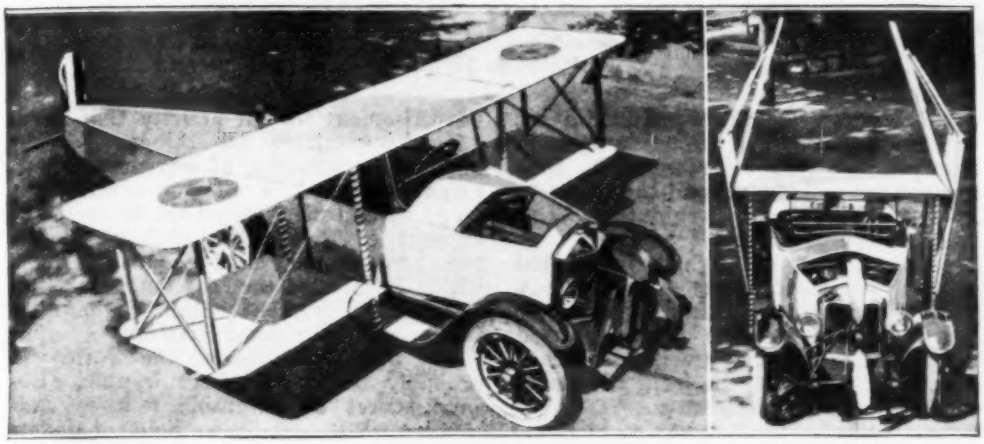
Several aerial enterprises, proposed by European air companies for South America, are typical of the activity that may be expected in that land of long distances and difficult travel. The Handley Page Company of Great Britain has offered to establish a service from Pernambuco south along the coast to Rio de Janeiro and Buenos Aires, this system to form the South American section of a projected transatlantic service. The same company proposes semiweekly air trips between the capital of Colombia, situated high in the mountains, and the ports on the Caribbean Sea. Vickers of England is interested in a similar scheme for Chile. The Italian firm of Caproni is responsible for the most ambitious project, however, suggesting a regular service between Chile and Genoa, Italy.

LITTLE THRESHING MACHINE BOON TO SMALL FARMER

The latest product of a Michigan farm-implement factory seems likely to start an "own your own thresher" movement among farmers who have been dependent upon the convenience of a community machine. The new thresher is 19 ft. long and 8 ft. 5 in. high, weighing with all equipment 3,600 lb., and handling 150 bu. of grain an hour. A tractor, 16 hp. or over, will run it. The threshing mechanism



This Grain Thresher is Expected to Prove Popular with the Small Farmer, as It will Make Him Independent of the Larger Traveling Machines, Whose Operators Dislike Stopping for Anything but Big Crops



This Automobile has been Inclosed in a Streamlined Fuselage. Through the Radiator Projects a Shaft Bearing a Propeller, and at the Driver's Right Hand Is a Lever Which Opens and Locks the Wings, or Folds Them Snugly against the Body. While This Combination of Land and Air Craft Is Now Only an Experiment, the Constructor Hopes Eventually to Travel as Easily in One Element as in the Other

is unusual, consisting of four claws on arms revolved by a crankshaft at 228 r.p.m., stripping the grain as it passes between them. The elevator arm is adjustable to any height of wagon bed for direct loading. With this individual-sized implement, the farmer has only himself to blame if his crop is not threshed at the proper time.

SWIMMING RACE AT PARIS WON BY AMERICAN

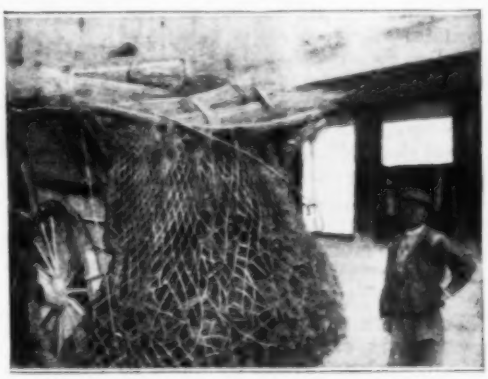
Great crowds along the banks of the River Seine recently watched an American soldier win the international swimming race across Paris, covering the distance of approximately four miles in 1 hr. 30 min. The victor's powerful, easy style was applauded repeatedly as he rapidly overcame the handicap of 500 meters (about 550 yd.) allowed the women contestants, and later crossed the line in an exciting finish just four-fifths of a second ahead of an Italian contestant.

FOLDING WINGS TRANSFORM AUTOMOBILE INTO AIRPLANE

A vehicle adapted to travel both on land and in the air is not a new idea, as motorcycles with folding wings have been suggested and designed in America and Europe. But to a citizen of Pennsylvania goes the credit for the most ambitious attempt in this line to date. His prodigy was first revealed to the public as part of a recent patriotic parade. The auto body was seen to be replaced by a streamlined fuselage. Through the radiator projects a shaft bearing an air propeller. By the driver's seat rises a lever which folds the wings flush against the body for travel on land, or extends them for flight.

PINE CONES USED AS FUEL IN SPANISH CITIES

Ordinary fuel has become so scarce in some parts of Spain that pine cones are being sold as a substitute for coal and wood in a number of cities. Peddlers deal in the scaly forest product,



Pine Cones Are the Stock in Trade of This Spanish Peddler. He Sells Them as a Substitute for Coal and Wood, Scarce Fuels in Spain Just Now

which they bring to market in enormous nets fastened to their mule-drawn carts.

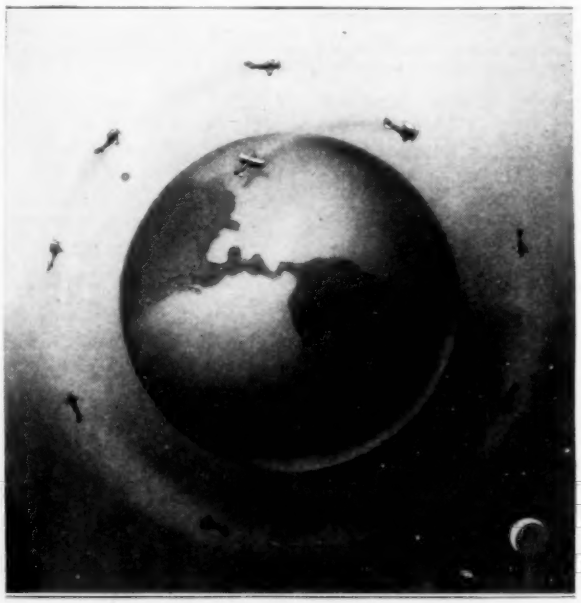
¶ Another midget airplane, reported from France, measures a little less than nine feet long, and is equipped with two 3-hp. engines, each driving a pusher propeller.

WORLD AWAITS GLOBE-CIRCLING FLIGHT BY MAGELLAN OF THE AIR

By PAUL A. JENKINS

"ON Monday, October 7, at 1:53 a. m., we alighted at our starting point in New York City, having reduced the time required for a flight around the globe to 13 days, 9 hours, and 22 minutes. With the exception of one replaced at Archangel, Russia, our 14 engines functioned faultlessly throughout the entire journey of 30,247 land miles. Our navigating officers express themselves as well pleased with the new automatic wireless mechanism which freed them from the usual tiresome turns at the controls."

The noteworthy feature of this bit of fiction is its entire plausibility. The reader of 20 years ago would have passed it by as a senseless dream. The reader of today is interested. He has seen the Atlantic spanned by air three times in less than two months, the last time by a monster dirigible already considered obsolete. During the war he traced the 7,000-mile nonstop cruise of a German Zeppelin from its start in the Balkans to German East Africa and return. He had seen in newspapers casual mention of flights by British biplanes from England to India.



The Cover of This Month's Popular Mechanics Magazine is Not Intended Primarily as a Prophecy of Achievement, but As a Symbol of the Spirit Which Impels Aviation's Pioneers, Even Now, to Heroic Trials and Demonstrations. Just So, a Flight Like the One Pictured will Be First of All a Dramatic Symbol of Man's Enlarging Freedom from the Tyranny of Time and Space

The modern reader, thus educated to the unusual, grants the possibility of a world-girdling flight. But the veteran airman declares it could be done tomorrow as far as the technical arrangements are concerned. Only the money and organization are lacking. And these not for long. The great air-craft producers, with the air services of the world powers, know that the feat will be a tremendous advertisement for an activity that needs advertising above all things. Already lacking the stimulus of war-time competition, the science of aeronautics will languish and die without the interest and support of the general public. Surely the professional enthusiasm and skill which have filled the last ten years with splendid achievement will not shrink from this culminating demonstration.

The first flight around the world will probably be made by a dirigible. Despite scores of miserable failures, millions of dollars lost in ships burned, collapsed, and shot down like great lumbering cattle of the air, the "Zeppelin" type has survived — survived to be recognized as the ideal vehicle for long-distance aerial transport, with its ability to make long nonstop voyages, to cruise with half or all of its power plants gone. The dirigible is reliable, too, and comfortable; and in size, lifting power, and speed limited only by the desires and resources of its constructor. The early construction of a 1,000-ft. dirigible is almost certain.

Clear-sighted experts, gathered at New York to welcome the officers of the "R-34," spoke time and again of a world-circling flight by dirigible. They pictured a supercraft five times as large as the "R-34," rated at 100 miles an hour, and carrying 200 tons of passengers, mail, and freight. A ship of this size and speed, with cargo space devoted to fuel and lubricants, and powered by a dozen

sturdy engines, should experience little difficulty in making the trip. The mammoth craft is certain to be built within the next few years, too.

Such a monster ship, on its pioneering voyage round the world, will be remarkably independent of terrain and local weather disturbances. Yet, to make success a certainty, certain preparations will be necessary. Weather observers scattered over the earth on sea and land will be asked to cooperate in piecing out the great air map already begun for the Atlantic and the United States. To coördinate this work for instant reference, meteorological stations with high wireless towers will be planted in the Far East and on the scattered islands of the Pacific. These same towers will then guide the world-circling dirigible like the lighthouses do the seafarer. Working with the wireless direction finder in the navigator's cabin, they will inform him of his position at any moment. A dozen repair and refueling stations—no more—will be organized at selected points along the great circuit. Intended only as temporary stopping places, they will be fitted with the mooring towers reported to be used even now by the British.

The Projected Circumnavigation of the Globe by an American Army Biplane may Involve This Routing, Easily Seen to Be Less Than a Great Circle of Earth. It Is Interesting to Compare This Itinerary with That Illustrated in Popular Mechanics Magazine for April, 1914, as the Route for the Proposed Race around the World. The Two will be Found Almost Identical in Many Sections

So much for the dirigible, destined to be the long-distance cargo carrier, the commodious and comfortable cruiser of the air. Interest turns even more eagerly to the swifter airplane, depending on speed for its very being, peculiarly the product of our hustling twentieth century.

And here our own army air service has already been at work, busy with plans, though denied achievement by an unappropriating congress. It is unofficially announced that, with proper support, the flight will be attempted by airplane before the end of this year. The bimotored Martin bomber will probably be the plane used, in view of its selection for the contemplated daylight journey from coast to coast. Some parts of the projected itinerary are hardly what one would expect. Starting from the Atlantic coast, the first lap will end in Newfoundland, the second in Greenland or Iceland, and the next in Ireland. Thence the flight will continue to France, to Norway, and east to Archangel, Russia. Then along the northern coast of Siberia, where ships will land with supplies. Crossing the Bering Sea the airmen will traverse Alaska, turn down the Canadian coast to Seattle, and thence to their starting point.

And in an age when anything may be predicted with the chance of its coming true, why not the prediction of a nonstop airplane flight around our dwindling globe, as suggested by this month's cover of Popular Mechanics Magazine? Airplanes as we know them are limited in performance by inherent necessities of design; but why not refuel the world-girdler by means of dangling tubes from the other planes as suggested by Lieutenant Locklear? The impossibility of today becomes the commonplace of tomorrow.

BANK DESK LESSENS LABOR AND SAVES FLOOR SPACE

For the use of the bookkeeper has been designed a desk which effects a saving in both floor space and working time. By lowering the top it becomes a "standing" desk for sorting checks and similar operations. By raising the top, the bookkeeper secludes himself in a miniature alcove, with two capacious drawers at his left, and on his right a shelf which supports ledger rack and ledger. Before him is the adding machine on its stand. The manufacturer of these desks supplies them in various dimensions.

The Bank Desk is Here Shown with the Top Down in Position for "Standing" Work, Like Sorting Checks. For Other Work the Bookkeeper Raises the Top and Takes His Seat. On His Right and Left Are Broad Shelves; before Him Is the Adding Machine

GOVERNMENT FABRIC TESTS PROVE DEPENDABLE

In spite of the haste in which it was necessary to do the work, War Department tests of material purchased by the government during the war for tents and clothing proved to be dependable. Modified forms of the bag, or funnel, and spray tests were used to determine the water-resisting qualities of canvas for tents, and the latter test was found to give more accurate information. Actual service showed the correctness of the results obtained by these means. It was found that the absorbent qualities of canvas had little or nothing to do with its value as a tent material.

PLAN INTERNATIONAL ROAD TO CONNECT AMERICAS

Connecting the United States with the countries of South America by means of an improved highway for automobiles, is the plan proposed by a New Mexico man for consideration by the Pan-American Union conference, which met in Washington, D. C., recently. Such an international road would run between El Paso, Tex., and Bogota, Colombia, if built according to the plan outlined by its promotor, and would pass through Mexico and the Central American republics. Work is being done at the present time on a highway between El Paso and Mexico City, the federal government of Mexico and the governors of several Mexican states coöperating with Americans in its construction. With this road completed, a considerable portion of the proposed link between the Americas would be a reality.

NEW PROCESS FOR COATING IRON WITH LEAD

Lead as a coating for sheet iron and other articles of the same material is declared to give satisfactory results if applied according to a new process. After being washed and otherwise prepared, the material to be coated is dipped into a solution of antimony chloride, and then through a suitable flux, floating on top of the molten metal, into the latter, the purpose of the flux being to cause the lead or antimony-lead to adhere. After being immersed in the lead bath, the article is submerged in oil. Material treated in this way can be bent without breaking the coating and exposing the metal underneath, according to the inventors of this new process. Sheet-iron shingles treated in this manner were exposed to the elements for two years and 11 months, but showed no signs of rust at the end of that period, though some were not painted. The process is cheaper, it is said, than galvanizing or tinplating.

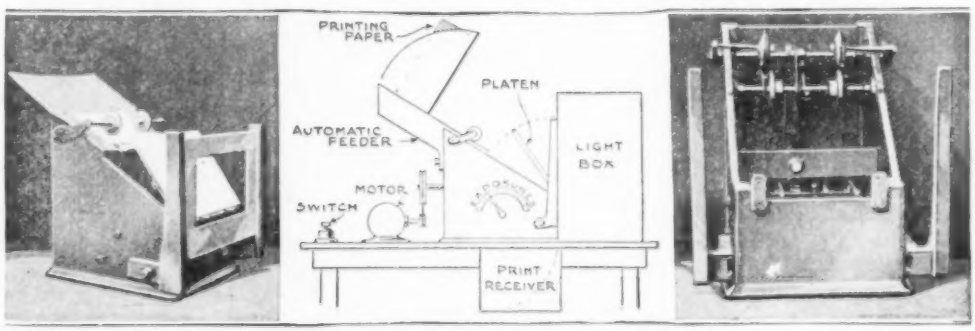
DESKLIKE PHONOGRAPH FINDS PLACE IN MUSIC STORE

To stimulate his sale of talking-machine records a music dealer has equipped his store with an odd phonograph. In appearance it is not dissimilar to the ordinary writing desk, with the motor-driven disk occupying most of the writing surface. On the left is a rack for the records, from which the customer is to make his selection; others on the right hold records selected and rejected. A small rack at the back contains announcements and advertising literature. The machine increases the efficiency of his salesmen by permitting customers to wait upon themselves.

A Music Dealer has Found Customers More Easily and Quickly Satisfied Since He Installed a Number of These Convenient Phonograph Desks in His Shop. As Seen More Clearly at the Left, the Motor-Driven Disk is Placed in the Center, with Racks at Right and Left to Hold Records on Trial and Records Selected. Other Racks Hold Advertising Matter and Musical Announcements

HIGH-SPEED PHOTO PRINTER WORKS LIKE PRESS

When the mechanical ingenuities of one art can be transferred to another, surprising results are often attained. A Wisconsin pressman has devised a remarkable photo-printing machine which operates practically on the principle of a printing press. When a stack of sensitized cards or paper is placed in the hopper, the negative clamped to the vertical glass front, and the electric motor started, the cards are automatically fed onto a platen, pressed against the negative, exposed to the light from three 40-watt lamps, and dropped into a rack.

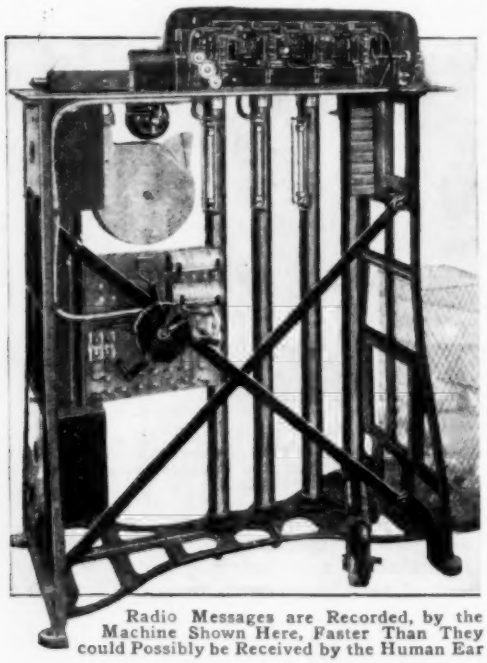


The Action of the Photograph "Printing Press" will be Clearly Seen from the Diagram. As Each Sensitized Card is Pressed against the Negative Three Powerful Electric Bulbs Flash in the "Light Box." The Feeder and "Light Box" have been Removed at the Left. The Right-Hand View Shows the Central Shaft from Which the Entire Apparatus is Operated

The length of time the lamps burn for each exposure is regulated by a dial. At the normal shaft speed of 2,700 r.p.m., the capacity is 3,000 prints an hour, up to 6½ by 8½-in. size. It can also print three post cards at one time, or 9,000 an hour.

WIRELESS RECEIVER PRINTS MESSAGES ON TAPE

Feeding its tape into a basket like a magnified stock ticker, a newly developed wireless-telegraph receiver prints dots and



Radio Messages are Recorded, by the Machine Shown Here, Faster Than They could Possibly be Received by the Human Ear

dashes at the rate of 400 words a minute, and has a trial record of 600. Not only is this an entirely new speed for radio reception, but since no human ear can interpret a message delivered at that rate, the speeded-up transmission becomes secret, except to stations equipped with the

A Section of the Sensitized Tape upon Which Dots and Dashes are Printed by the Wireless-Telegram Receiver

recording device. The tape may be filed as a permanent record.

The process is photographic. The receiver contains 1,000 ft. of sensitized tape, upon which a mirror of minute size, oscillated by the electric impulses, imprints the dots and dashes of the message, in a form easily deciphered. An electric motor draws the tape through a series of four vertical tubes, containing, in order, developer, fixing hypo, washing water, and, last, a drying oven. The full tape takes a 10,000-word message averaging roughly a word to the inch. While the impulses are being printed, they are also visible as flashes on a ground glass.

With this device some success has been attained in the reception of two separate messages at one time from the same antenna, promising the possibility of a multiplex system of radio.

ATLANTIC-FLIGHT ENTRIES MEET CROWNING MISHAPS

Airmen Hawker and Alcock seem to have taken with them Newfoundland's entire supply of horseshoes. After their departure, their former rivals, the Handley Page and the Martinsyde, suffered nothing but misfortune. The first was wrecked during an attempted flight to Mineola, L. I., for the purpose of welcoming the "R-34." In the darkness over Nova Scotia, a broken connecting rod disabled one engine and compelled the crew to descend. They cruised two and a half hours over a little town on the Bay of Fundy, awaiting the dawn. At five in the morning the plane touched ground, tore through several unnoticed fences, and was finally tipped on its nose by a stunted spruce tree. Back in Newfoundland, several days later, Raynham attempted a second start in his rebuilt Martinsyde. But he carried too much gasoline, and after a 50-yd. "hop" crashed heavily to earth.

LOST SHIP EASILY LOCATED BY MODERN RADIO METHOD

In these days of the radio compass and instant wireless communication, a ship at sea is in little danger of losing its way. Recently the "Louisville Bridge" lost its bearings in a heavy fog off the coast of New Jersey, and was unable to find Ambrose Channel into New York Harbor. The operator called the navy yard, and within five minutes received the answer, "Your true bearing at 4:43 p. m. from Rockaway Beach two-hundred ten, Sandy Hook sixty-seven, Mantolocking fifteen." The auto tourist asking the best route to town could hope for no more definite information than that.

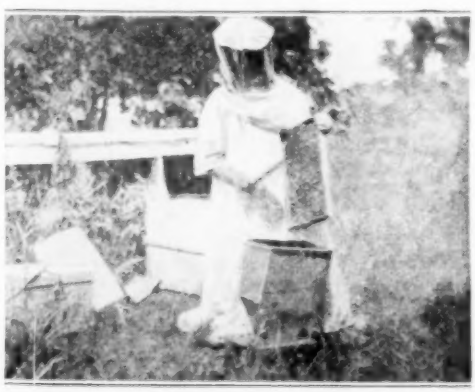
BEES' STINGERS MAKE PROFITABLE CROP

By SAM E. CONNER

RAISING bees for the stings pays an eastern woman better than keeping them for the honey which they would produce. From these stings is secured the purest formic acid obtainable, and the customers are the manufacturing druggists of the country. During the past 24 years this woman has supplied one firm with 25,000 stings annually; other concerns take from 500 to 5,000 each year, making a yearly trade of 50,000 stings. To produce this number, but two colonies of bees are necessary, while it would require 50 colonies to make an amount of honey equal in value to the stings.

The method of taking the sting from a bee is simple. The bees are first gathered in a specially arranged box, by shaking a comb on which they are working over the mouth of the box. Next, in a room with all the shades but one drawn, the box is opened. As the bees come out of the box they are attracted to the lighted window, and cluster there on glass or screen. Mrs. Beekeeper picks up the insects by their heads and, holding them under a magnifying glass, draws the stings. For this purpose a small pair of tweezers is used. The stings are placed in a dish filled with milk sugar, which covers them with a coat that prevents decay.

Stingers are Drawn from Bees with a Small Pair of Tweezers and Sold to Manufacturing Druggists, Who Make from Them Formic Acid, Used in the Treatment of Rheumatism, and Other Ailments



The Bees are Shaken from the Comb into a Box and Taken to a Dark Room for Removal of the Stingers

Through the Sale of Stingers from Two Colonies of Bees This Woman Obtains as Much Revenue as She would from 50 Colonies Kept for Their Honey. She Sells Some 50,000 Stingers a Year. The Picture Shows One of the Hives

Each sting contains a small amount of formic acid, which is removed by distillation. This acid is used in the treatment of rheumatism by homeopathic physicians, being administered in much reduced strength, while doctors of the regular school use it, reduced one-half, for restoring circulation in cases of paralysis, applying it externally. Formic acid was one of the first of the solid-fat acids discovered. It was originally obtained by distilling common red ants (*Formica rufa*) from which the name is derived.

The owner of this unusual business has only been severely stung once in all the years she has kept and handled bees. That time she suffered no serious results. She is frequently stung by a bee through negligence on her own part, however.

ROOSEVELT-MEMORIAL DRIVE NATIONAL IN SCOPE

A plan to create a suitable national memorial to the late Theodore Roosevelt has been launched and will culminate in a campaign for funds from October 16 to 29, it is announced. The project contemplates a monument in Washington, D. C.; a park at Oyster Bay, to include, eventually, Colonel Roosevelt's home at Sagamore Hill, and the formation of an association to foster and perpetuate the Roosevelt ideals.

WHIRLING SPRAYERS SUPPLANT TRENCHES IN FRUIT ORCHARDS

Owners of several fruit orchards are using tall revolving sprayers for irrigation, believing them more efficient than the conventional ground trenches. The typical sprayer is fed by a 2-in. hose, water issuing from two whirling arms above the tree tops, on which it falls in a 150-ft. circle. Evenness of distribution and freedom from water waste recommend this system. In addition, water falls on the leaves like rain, washing away the dust and stimulating growth. The sprayers are mounted on wheels for easy transportation about the orchards.

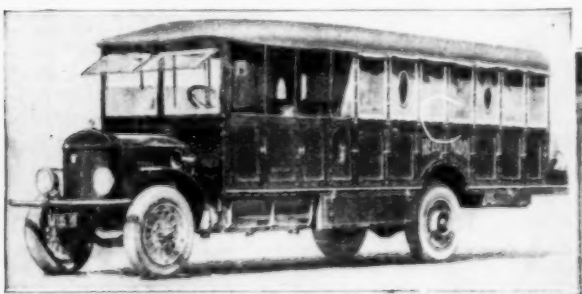
Tall Whirling Sprayers are being Used by Many Fruit Growers to Distribute Irrigation Water. They Claim Efficient Irrigation and Conservation of Water as Advantages of the Method

INTERNATIONAL CABLE CODE PRINTED IN NINE TONGUES

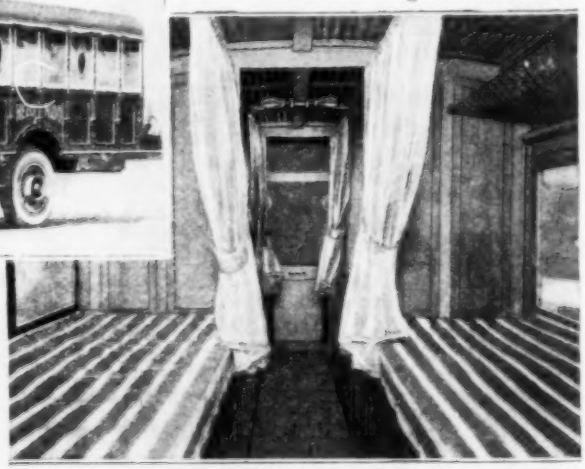
International trade is expected to be encouraged by a new cable-message code system that makes possible decoding in nine different languages without translation. Several hundred linguists and commercial experts have been at work on the code book for the last three years, and it is considered complete in every respect. The languages are English, French, Spanish, Portuguese, Italian, German, Dutch, Japanese, and Russian. Business firms employing this code book will find it an easy task to decipher a message into any of these languages. Figures can be sent in a condensed form, thus adding economy to the other advantages of the system. It is also possible to condense the words in a message, a single code word representing a complete sentence.

FAMILY AUTO TRUCK IS LIKE PALACE SLEEPING CAR

Designers of special auto bodies evidently are striving to achieve the limit of luxury on wheels. Now the president of an Indiana motor concern has made a two-ton truck into a veritable rolling hotel, with sleeping compartments for four persons inside, and a comfortable berth in front for the driver. All conveniences, such as kitchen facilities, light and water supply, are provided, and there are plenty of lockers and regular windows.

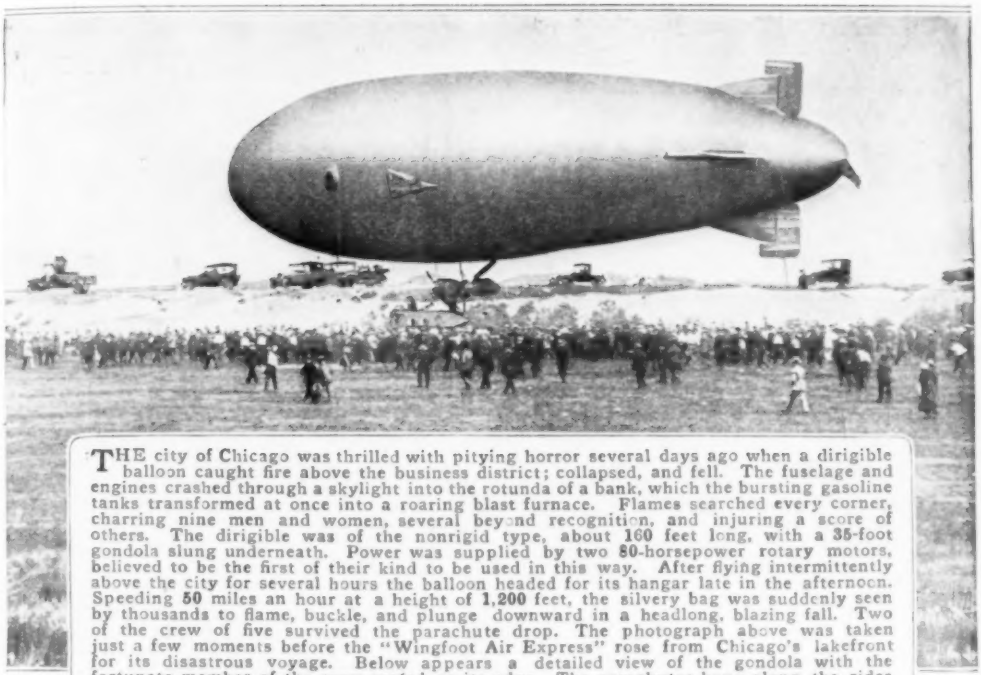


A Commodious Dwelling on Wheels: This Special Body, Placed on a Two-Ton Truck, Has All the Conveniences of a Home, and will Accommodate Four Persons

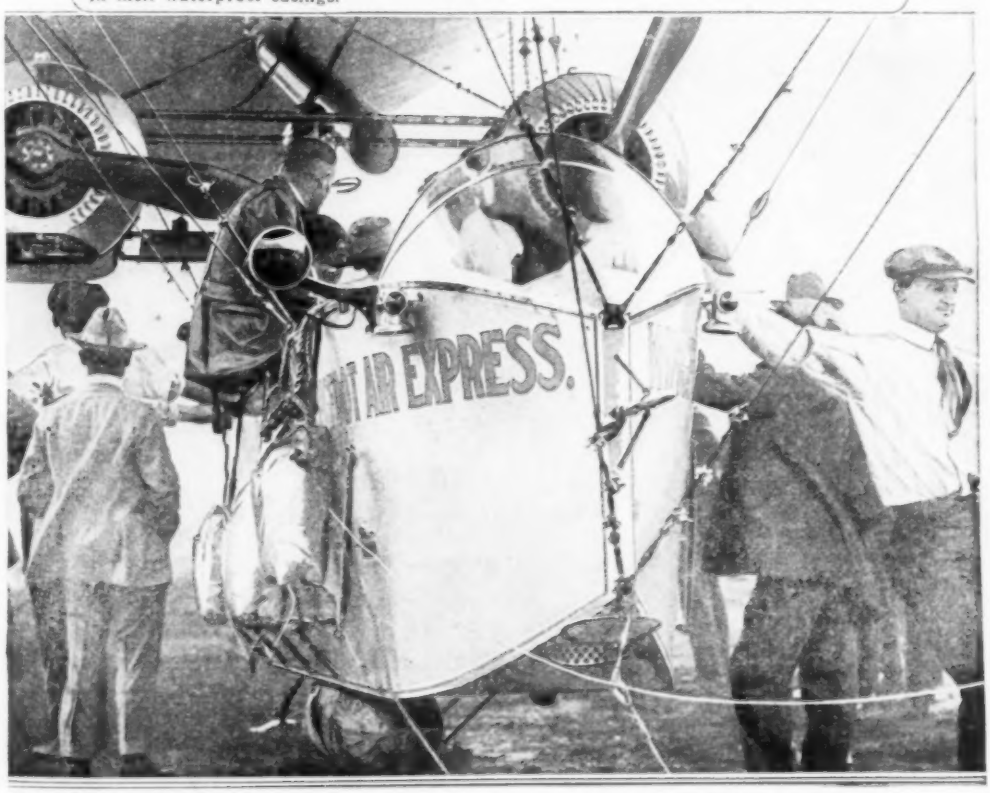


Interior of the Motorized Hotel: This Picture Shows the Wide, Comfortable Berths. Besides, There Is a Kitchen, and Electric Lights and Running Water are Provided

BLAZING DIRIGIBLE CRASHES THROUGH BANK ROOF

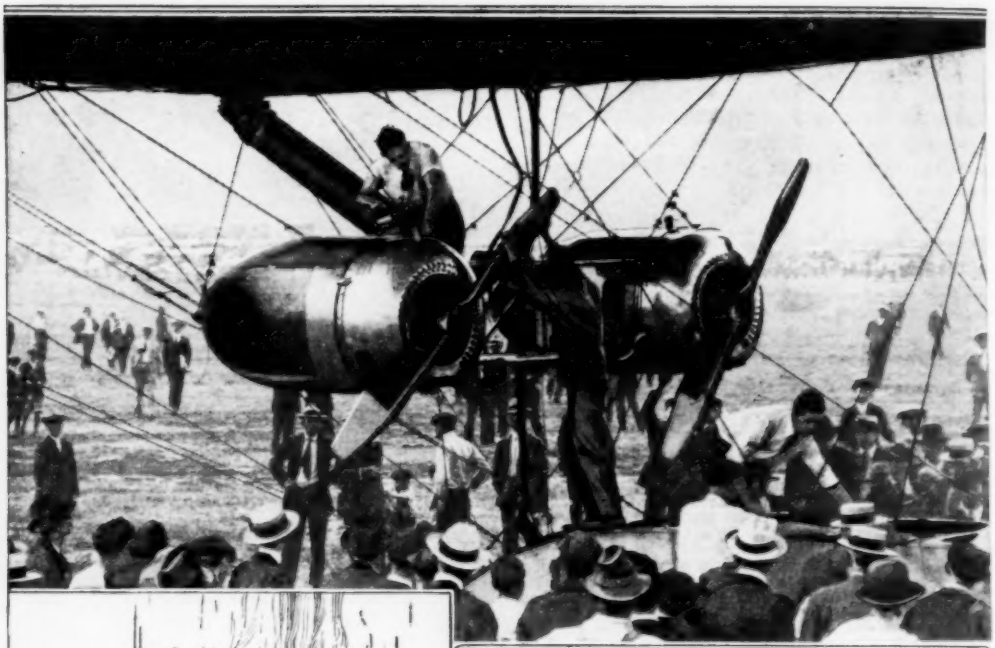


THE city of Chicago was thrilled with pitying horror several days ago when a dirigible balloon caught fire above the business district; collapsed, and fell. The fuselage and engines crashed through a skylight into the rotunda of a bank, which the bursting gasoline tanks transformed at once into a roaring blast furnace. Flames searched every corner, charring nine men and women, several beyond recognition, and injuring a score of others. The dirigible was of the nonrigid type, about 160 feet long, with a 35-foot gondola slung underneath. Power was supplied by two 80-horsepower rotary motors, believed to be the first of their kind to be used in this way. After flying intermittently above the city for several hours the balloon headed for its hangar late in the afternoon. Speeding 50 miles an hour at a height of 1,200 feet, the silvery bag was suddenly seen by thousands to flame, buckle, and plunge downward in a headlong, blazing fall. Two of the crew of five survived the parachute drop. The photograph above was taken just a few moments before the "Wingfoot Air Express" rose from Chicago's lakefront for its disastrous voyage. Below appears a detailed view of the gondola with the fortunate member of the crew seated on its edge. The parachutes hang along the sides in their waterproof casings.



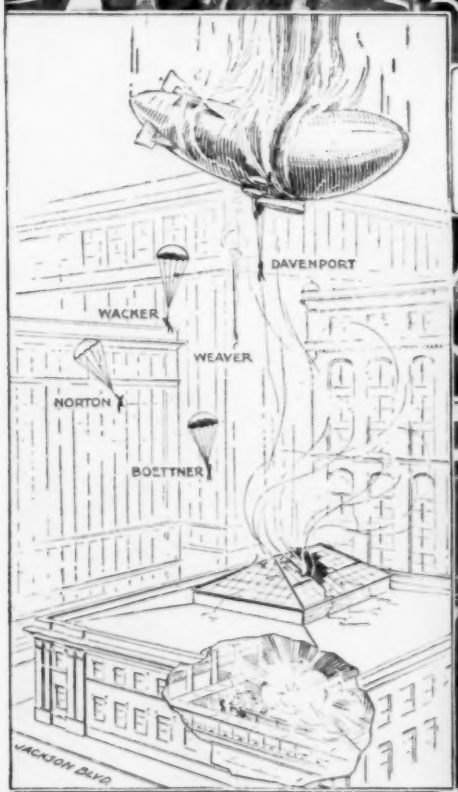
COPYRIGHT, POPULAR MECHANICS MAGAZINE

STRANGE WAS THE FATE THAT DROPPED THE "BLIMP"

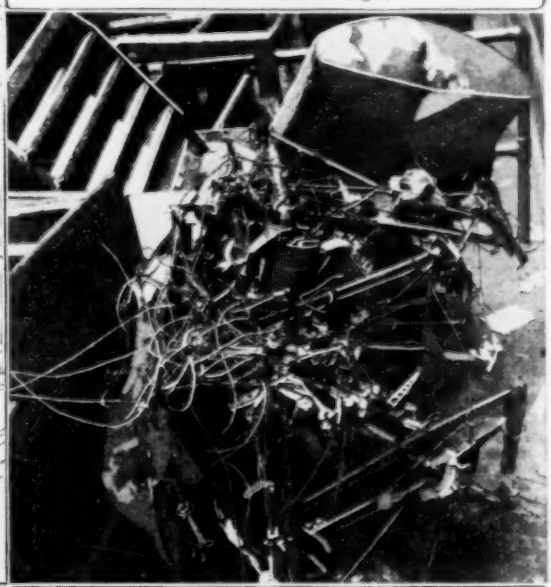


COPYRIGHT, POPULAR MECHANICS MAGAZINE

The Investigation by the States Attorney has Concerned Itself in Large Measure with These Two 80-Horsepower Rotary Motors. The Use of This Type on Dirigibles is Declared Highly Dangerous by Many. One of the Two Mechanics in the Crew is Shown with a Blowtorch Removing Oil from the Engine Hoods Just before the Start of the Fatal Flight



This Diagrammatic Sketch of the Accident Depicts the Fate of the Occupants. Davenport's Parachute Tangled in the Rigging; Weaver's Burned; Wacker and Norton were Broken on Landing; Only Pilot Boettner Reached the Ground Unharmed



COPYRIGHT, INTERNATIONAL FILM SERVICE

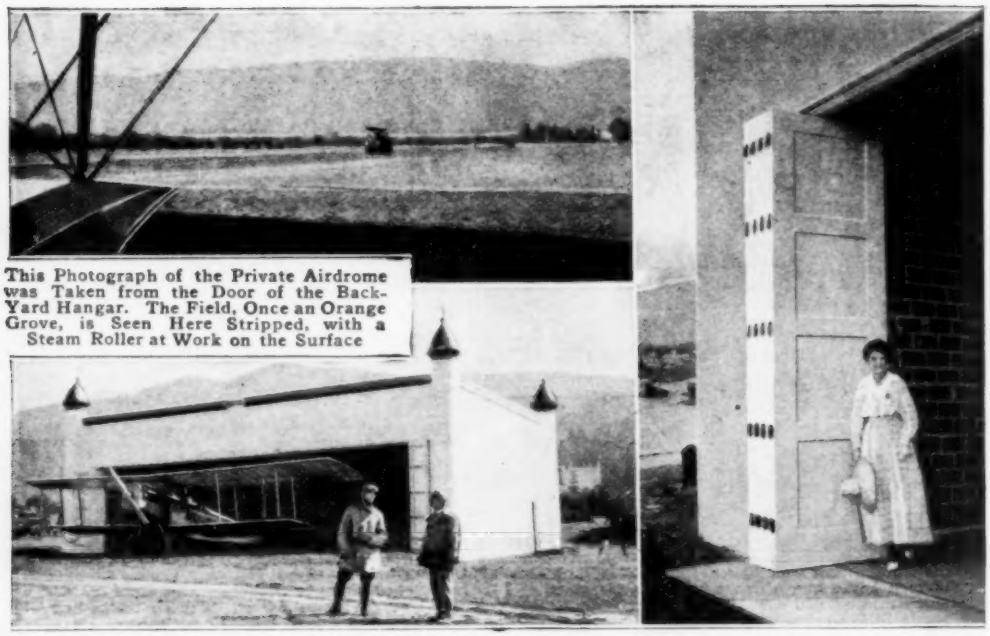
This Tangled Heap of Twisted Metal Is the Remains of One Engine. Although Many Lay the Responsibility for the Disaster on the Engines, an Army Expert Ascribes the Explosion to Friction between the Silk Ballonettes in the Envelope

UPON CHICAGO'S ONLY TWO-STORY LOOP BUILDING

This Photograph was Taken Just a Few Moments after the Unprecedented Disaster Which Claimed Thirteen Lives and a Score Injured. Firemen and Other Rescuers have Reached the Roof of the Bank Building and are Preparing to Train a Hose on the Dying Flames Below. The Shattered Skylight is Still Dotted with Patches of Smoking Fabric, as a Physician Busies Himself with the Charred, Broken Body of the Unfortunate Whose Parachute Failed to Open. Firemen and Police, Aided by Soldier Volunteers, Are at Work Meanwhile in the Rotunda, Removing the Mutilated Bodies of the Dead and Injured

This Is the Rotunda of the Illinois Trust and Savings Bank, Directly beneath the Skylight: Here Worked 150 Bookkeepers and Stenographers, Most of Whom Were Women. Some were Crushed by the Impact of the Motors and Tanks; Others, in a Frantic Dash for the Cage Exits, were Consumed by Blazing Oil Which Ate into Cloth and Flesh; Many were Slashed by the Torrent of Broken Glass from the Skylight. Roaring Flames Seemed to Seek Out Every Corner of the Spacious Interior, Marring Walls and Floors, Even Cracking Costly Marble Pillars. The Intense Heat Made Rescue Work Impossible, in Some Cases for 30 Minutes

PHOTOS COPYRIGHT, INTERNATIONAL FILM SERVICE

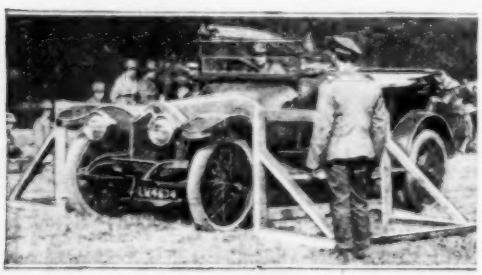


This Photograph of the Private Airdrome was Taken from the Door of the Back-Yard Hangar. The Field, Once an Orange Grove, is Seen Here Stripped, with a Steam Roller at Work on the Surface

Following His Decision to Use an Airplane for Visits to His Extensive Property Holdings, an Enterprising Bank President Ordered the Erection on His Suburban Estate of the Hangar at the Left. The Structure Is of Brick and Concrete, with Bellows Doors Which Collapse to Leave the Entire Front Unobstructed, as Seen at the Right. An Ex-Army Airman Pilots the Owner on His Trips

BRITAIN ASKS UNIFORM SKILL OF WOMEN MOTOR DRIVERS

British women who volunteered for work in the army service corps were put through a course of field training before they were assigned to their regular duties. Numbers of volunteer chauffeuses were thus trained daily in a great London park. Here they were eventually subjected to several practical tests, among them one to try their judgment of distance. Two broad hurdles were placed facing each other and separated by a little more than the width of the car, and the test consisted in driving through this narrow gate without touching the hurdles.



COPYRIGHT, WESTERN NEWSPAPER UNION

This Test of Skill was Required of Britain's Women Motor Drivers. The Machine can be Driven through the Narrow Gate Only by a Practiced Hand

BUSINESS MAN OWNS PRIVATE HANGAR AND LANDING FIELD

Scarcely less impressive than the first transatlantic flight is the first back-yard aerodrome, when viewed as an indication of the public's growing interest in aeronautics. It is situated on the grounds of a suburban home maintained by a western bank president. To form the landing field he ordered an orange field grubbed out and leveled with a steam roller. On one side he built a hangar of brick and concrete, with bellows doors which collapse to leave the entire front of the hangar unobstructed. The necessity of frequent visits to land holdings in a distant county impelled him to take these steps. The tedious 250-mile journey over mountains and desert has previously taken three days; but with his airplane will be made in five hours or less. His pilot, a former lieutenant in the army air service, has already driven him on trips to the city, to the golf links, and to near-by beach resorts.

¶A British airman recently flew in one day from Mosul on the upper Tigris, over the Syrian Desert, to Cairo on the Nile, making three stops on the journey of 1,100 miles.

"MENSURGRAPHY:" A PHOTOGRAPHIC METHOD OF STUDYING DEFORMITIES

By ROBERT H. MOULTON

A NEW method of making true records of changes in the external appearance of the body, which not only promises valuable aid in the child-welfare program, but will undoubtedly also interest military and police authorities as well as physicians, has been developed by a New York City physician. This method, which the originator calls "mensurgraphy," has just been announced to the medical fraternity, although it now appears that the army medical service has been using it for some time.

With the "Mensurgraph" This Face may be Analyzed and Measured to the Twelfth of an Inch, Suggesting Its Use in Recording Criminal Physiognomies

Briefly, the system of mensurgraphy consists in using the camera as an instrument of precision. The photographic records made of the external appearance of the body at different times, are taken under exactly the same conditions of light, distance, and position of the subject; and by comparing pictures taken at different periods it is possible to learn what changes have occurred in the intervals.

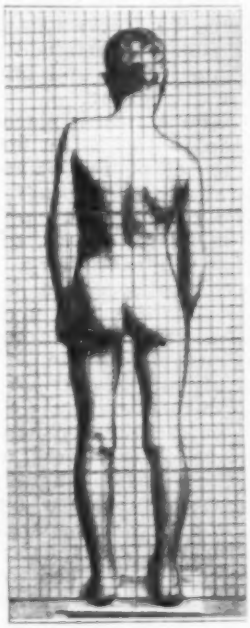
This Photograph was Printed without the Use of the Squared Scale, Giving an Unobstructed General View of the Subject

These measure-picture records should be of great value in observing the progress of improvement of orthopedic cases of all types. For instance, a stooping attitude and its correction might be graphically shown in lateral pictures, with the difference in the line of balance in the two postures. A stiff knee joint may be illustrated, and its improvement shown better by mensurgraphy than by any number of tape measurements. Incorrect postures at a school desk may also be recorded by this method. In fact, its use seems almost unlimited as a means by which the least tendency to drop below the normal standard of bodily fitness may be detected and, through corrective agencies and exercises, removed.

While other physicians have used the camera for making physical measurements of subjects under study, the records so secured were not reliable for the reason that the camera itself is not altogether trustworthy, for, as students of photography know, many things may cause the lens to distort and fail to produce a faithful image; the power and source of the light, the direction from which the light comes, the position of the subject, the care with which the focusing is done, being among them.

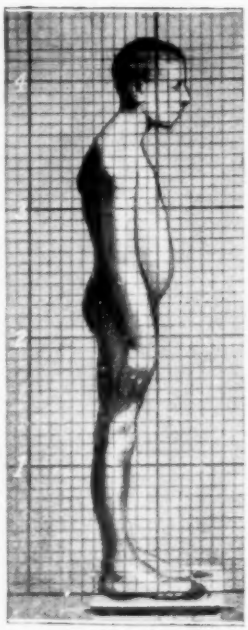
The way in which the mensurgraph photographs are taken is interesting. For lighting his studio, the physician employs a mercury-vapor arc lamp, thus insuring a uniform degree of illumination at all times. This light, being very rich in ultraviolet rays, enables him to make instantaneous exposures, so that any possibility of movement on the part of the subject while the photographs are taken is precluded.

A white stool has painted upon it two sets of black footprints; one set facing toward the front, and the second at right angles to the former. A person standing upon the first set would, therefore, face the camera, while when he stands upon the second



The Measuring Lines have Now been Imposed on the Negative, Permitting Accurate Measurement of Deviations from Normal

set he presents a profile to the camera, which is placed at a fixed distance and height in front of the stool. This distance was determined by experiments, the focus of the lens being an important factor in determining it. Thus, with a lens of 9½-in. focus, it was found that the camera must be placed 10 ft. 4 in. in front of the stool, and 4 ft. 1½ in. from the floor. These distances are marked by two small tacks driven into the floor, and the points are located by means of plumb bobs attached to both the stool and the camera. This is to insure that the size of the person photographed should bear a simple relation to the size of the image on the camera's ground glass. With the subject and camera so arranged a child, 4 ft. 5 in. tall, will, when placed on the stool, measure 4⅝12 in. on the ground glass.

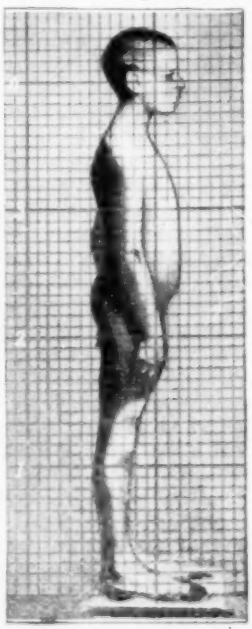


A Record of Defective Carriage, to be Compared with the Lower Picture

Across the front of the white stool are painted two black lines, one horizontal and the other at right angles to it, the two thus forming a large "T." By this means it is easily ascertained that the ground glass and the subject are in register.

The subject is placed on the stool, with his feet fitting into one set of the painted footprints, and photographed in the ordinary way on a 5 by 7-in. plate, except, of course, that extraordinary care is used to secure a maximum of definition and a minimum of distortion. The manner of printing from the negative is really the key to the method of mensurgraphy.

Before the sensitized sheet of paper is printed, a screen, or scale, consisting of a semi-opaque substance on which are drawn transparent lines, with two cross hairs at the bottom, is placed over the face of the negative. The cross hairs on this screen are placed in exact register with the cross-hair lines, or T-figure, on the stool, as they appear in the negative, the result being a scale of squares, representing inches, upon the print. The screen in place, the paper is exposed in the ordinary way, and the subsequent development gives a print in which the subject is seen standing behind a network of black lines. It is then possible to locate and accurately measure every outward phase of the physique.



"Mensurgraphy" Shows Exactly How the Subject was Benefited by Proper Exercise. The Increase in Height may be Accurately Measured by Reference to the Horizontal Lines

The value of mensurgraphy lies, of course, in the comparative study of a series of pictures taken at regular intervals. The screen lines will always appear in the same places on the body, unless the subject has undergone some outward change since the preceding photograph was made, and in this case the lines reveal the exact direction and degree of the change.

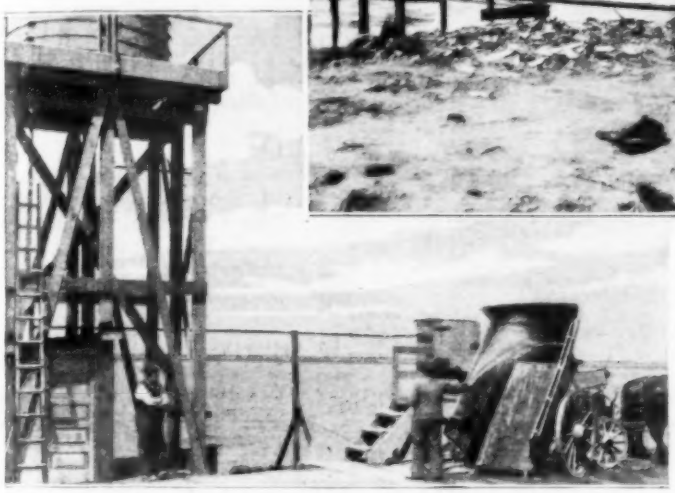
If it is desired to secure an even finer measurement of any individual portion of the subject, an enlargement is made of that part of the body. Taking the face, for example, we may find that it measures 8 in. from the top of the head to the point of the chin, as shown by the squares in one of the illustrations. An enlargement is then made, which, when measured by rule, is exactly 8 in. Upon this enlargement is placed a large, ruled screen, divided into square inches, each square subdivided into twelfths of an inch. Thus it is possible to measure developmental changes, deformities, skin lesions, or other morbid formations, to the one-twelfth of an inch, and a means provided of permanently recording their growth or abatement.

While our military authorities have not yet announced the manner in which they have used mensurgraphy, it seems likely that it was employed to show bodily changes due to the physical training the soldiers received. In police work it affords a means of identification.

COAST CITY SOLVES PROBLEM OF GARBAGE DISPOSAL

A large west-coast city has solved its garbage-disposal problem in a simple but effective way. The refuse is carried in the usual scavenger wagons to a remote section of the city beach. Here it is dumped, and instantly covered with a thick layer of sand pumped from the bay by a small electric dredge. A merit of this method is that many acres of land are reclaimed from the ocean each year. The city makes further use of its natural advantages by having each driver wash his emptied wagon with sea water at a pumping station installed near the dump, before returning to the city. This salt bath frees the wagons from offensive odors and the fly nuisance for their return trip through the city streets.

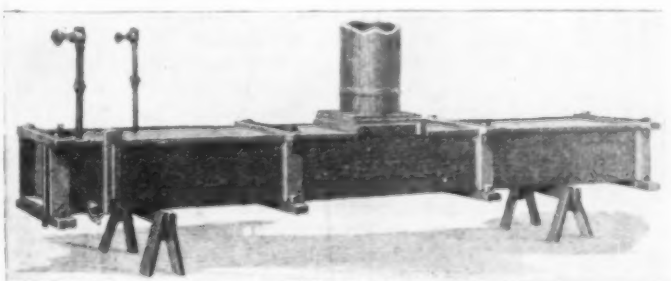
Sand Pumped through This Pipe Line is Used to Cover City Garbage, and Incidentally to Reclaim Much Good Land, as in the Foreground



A Secondary Feature of the City's Simple Garbage-Disposal Plan Is This Use of Salt Water to Cleanse the Wagons. Washed Immediately after Dumping, the Wagons are Thus Freed from Flies and Odor, for Their Return to the City

STEAM CIDER EVAPORATOR MAKES APPLE JELLY

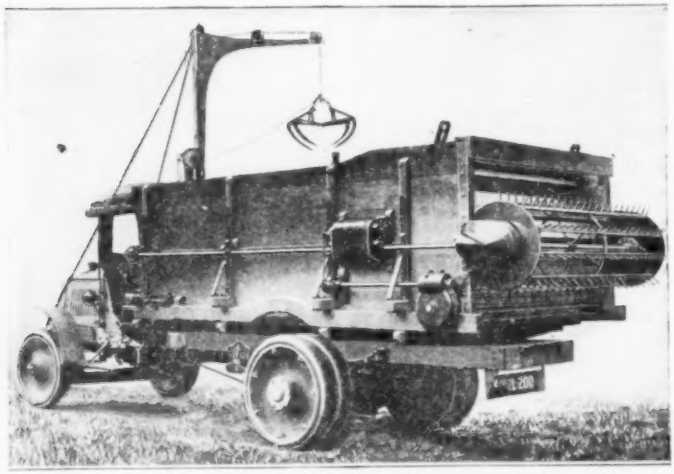
Apple cider is converted into jelly, or prepared for bottling, in a brief time and without danger of burning, by a steam evaporator of simple construction now being used in apple-growing sections. The apparatus consists of a covered wooden trough, in which are copper-tube coils for the passage of steam when the evaporator is in operation. A partition in the trough extends from one end to within a few inches of the opposite end, and cider, entering the trough at the end where the partition joins, is forced to travel in a circuitous route over the coils to reach the outlet, which is at the same end of the trough as the inlet but on the opposite side of the partition. Vapor generated in the process is carried away by a vertical wooden pipe set in the center of the trough cover.



In This Simple Steam Evaporator Apple Cider is Quickly Made into Jelly or Prepared for Bottling. Annealed-Copper Tube Coils, inside a Covered Wooden Trough, Heat the Cider, Steam being Admitted through the Pipe at the Left

FARM TRUCK HAS APPLIANCES FOR HANDLING FERTILIZER

Motor-truck bodies designed for special uses are coming more and more into evidence. One recently assembled on a six-ton chassis for the handling of farm fertilizer is equipped with a loading crane, a worm-driven roller at the end of the bed, for working out the contents, and a toothed drum, just above the roller, for breaking up the fertilizer as it leaves. All these appliances are operated by gearing from the truck motor. They are readily removed for ordinary hauling work.



A Six-Ton Truck Equipped with a Spreading Roller, a Loading Crane, and a Toothed Drum for Breaking Up the Fertilizer, All Operated by the Propelling Motor: They can be Removed When the Truck is Used for Ordinary Hauling

GERMANS PRINT PROPAGANDA IN VOLUME OF HOMER

With the end of the war have come many revelations of the unusual methods used by the Germans to spread their harmful propaganda in the countries arrayed against the central powers, and of the clever work which often frustrated their well-laid plans. In one case, what appeared to be an old and worn copy of the works of Homer proved to be a volume of attacks on British rule in India. Only the first few pages of the book were printed with the words of the ancient poet. The remainder, though in Greek type like the beginning, was filled with the diatribe. The volume was addressed to an educated Hindu capable of translating the Greek into an Indian dialect.

NEW ASSAY-OFFICE VAULTS LARGEST IN WORLD

In the underground vaults of the new United States assay office, the cornerstone of which was laid recently in New York, can be stored more than $20,000,000,000 in gold. They are said to be the largest and finest in the world. Five of the eight stories of the building will be located beneath the surface of the earth. Sealed in the cornerstone of the structure are copies of several newspapers; a medal on which there is a portrait of the president, and a bag containing a set of United States coins, ranging in value from one cent to $20, besides other articles of interest and value. The building will cost over $800,000. A number of government officials attended the cornerstone-laying ceremony, and were guests at a luncheon given by prominent bankers of the city after the stone had been sealed.

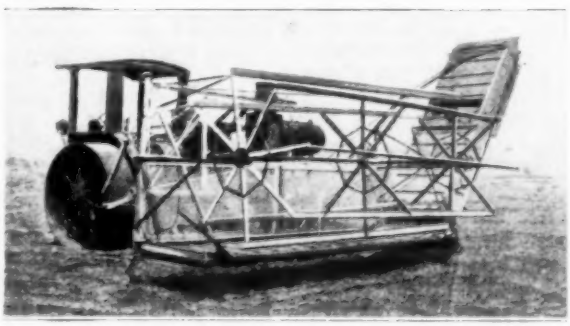
WHEELED STEPLADDER MOVED BY TURNING A CRANK

When the user of a newly invented stepladder wants to move it along to another spot, he does not have to descend and carry it, and then climb up again. He merely turns a crank at the top with one hand and holds a steering handle with the other, and travels. The four legs of the ladder are equipped with small wheels. One of those at the rear is connected by chain or belt to a pulley or sprocket on the crank axle, while the two forward ones are pivoted and connected to the steering rod.

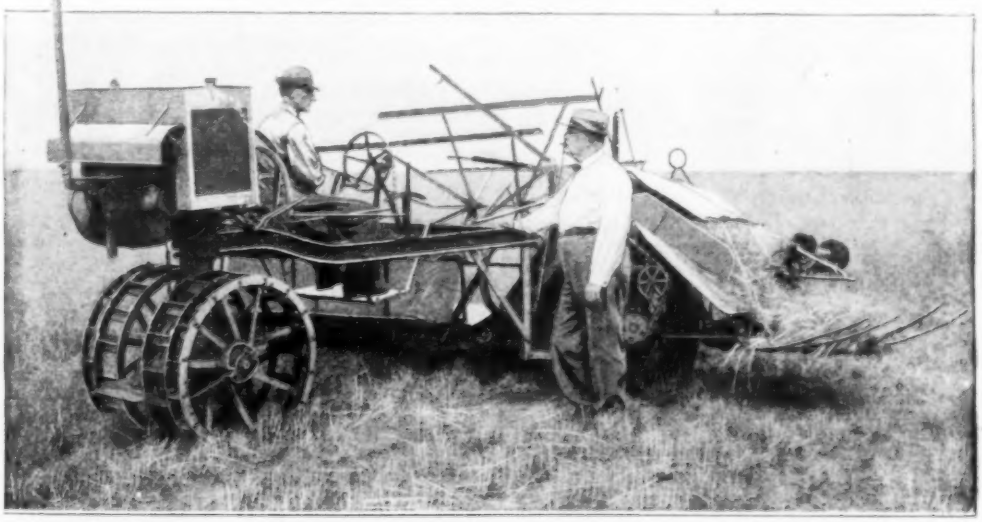
Invented by a Kansas Farmer, the Elevator Pictured Here Carries Wheat Heads to the Top of a Stack as Rapidly as They are Thrown from the Wagon to the Receiving Platform of the Machine

TRACTOR-OPERATED HARVESTING MACHINES

HARVESTING the enormous wheat crops of Kansas and Nebraska is a task of such proportions as to be almost impossible of accomplishment without the aid of the tractor. The farmers of the states no longer consider the machine a doubtful substitute for horses, but regard it as an absolute necessity in the fields. Many of them have applied their experience with the tractor to developing new methods of using it, and their



Combination of a 12-Foot Header and a Powerful Tractor: The Harvesting Machine is Driven by a Chain from a Sprocket on One of the Drivewheels of the Tractor



Fastened behind an Ordinary Binder, This Two-Wheeled Tractor Supports the Rear of the Machine and Steers It across the Wheat Fields. One Man Controls the Mechanism

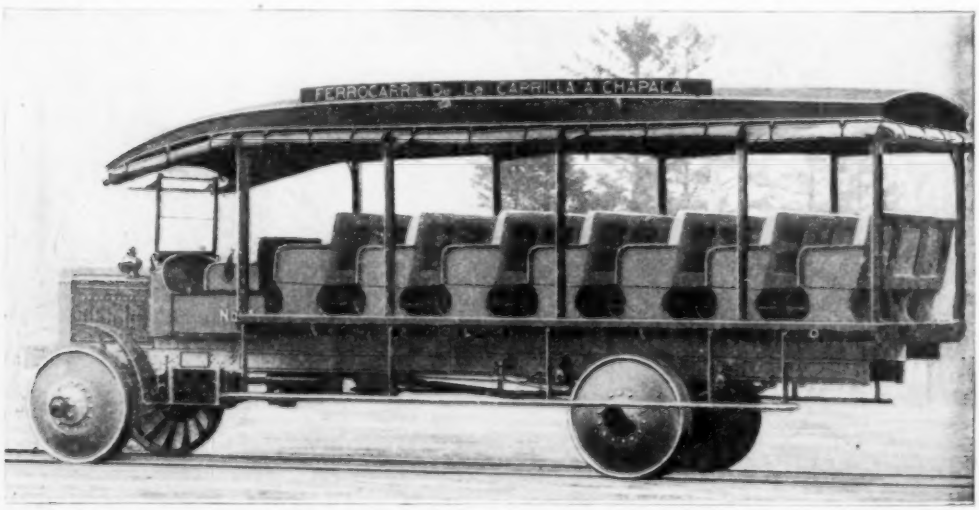
Scene in One of the Great Wheat Fields of the Middle West, Showing a Combined Tractor and Harvesting Machine at Work. The Latter is Loading the Grain into a Wagon Which Travels Alongside

ideas in a number of cases have proved to be valuable. Among the recent improvements brought about in this manner are combined tractors and headers, the latter being the giant harvesting machines used where wheat acreage is large. One of these combinations is a 12-ft. header, attached to the front of the frame of a powerful tractor, and driven by a chain from a sprocket on the left drivewheel of the latter. In another, a two-wheeled tractor forms the rear support of an ordinary binder, and not only pushes the havesting machine, but steers it as well.

Many headers and binders are now manufactured for attachment in front of standard tractors. Another invention that has been found useful in the wheat belt is the wheat-head elevator recently devised by a Kansas farmer. In this the grain is carried in a trough to the top of a stack by a crossbar conveyor operated by a gasoline engine. The receiving platform of the elevator is at such a height as to make the work of transferring wheat heads from wagons to the elevator an easy matter.

HEAVY PASSENGER TRUCK RUNS ON NARROW-GAUGE RAILWAY

South American railway gauges are far from standardized, varying from 5½ ft. down to the contracted arrangements universally classed as "narrow gauge." On the order of one of the latter systems, a Wisconsin motor-truck builder has just turned out a special five-ton chassis, equipped with flanged steel wheels. A platform body with permanent top has seven seats besides the driver's, accommodating 21 passengers. The car is wholly without steering mechanism. The sides are equipped with running boards.



Five-Ton Truck with Flanged Steel Wheels, Specially Designed to Run on Narrow-Gauge South American Railways: No Steering Mechanism is Provided. The Car Accommodates 21 Passengers

CORPORAL'S WAR SOUVENIR SIGNED BY GENERALS

Military regulations place many obstacles in the way of enlisted men who desire to obtain favors from commissioned officers of high rank. In spite of this, a Denver corporal, recently returned from service in France, brought with him a souvenir on which are written the names of 78 generals of the American and allied armies. The autographed memento is a white-silk scarf on which are sewed small flags of the countries that fought the central powers. Among the signatures which appear on the cloth are those of General Pershing, General Pétain, General Dickman, and Secretary of War Baker. The corporal used some interesting methods in acquiring the collection.

¶ Aren fiber, obtained from a palm of the same name in the Dutch East Indies, is said to be suitable for covering submarine cables. It is used by natives of the islands for rope making and thatching.

CHEESECLOTH TANK BUILT TO FOOL ALLIED AIRMEN

Some overworked German camoufleur probably received an iron cross for contriving the fake tank shown in the photograph. It was found by advancing Americans in the St. Mihiel salient, bristling with stovepipe artillery, and covered wth cheesecloth armor. Mounted on a wagon, the mosquito-proof structure could be moved about at will behind the lines. It was built to fool allied aerial observers, which it may have done with great success.

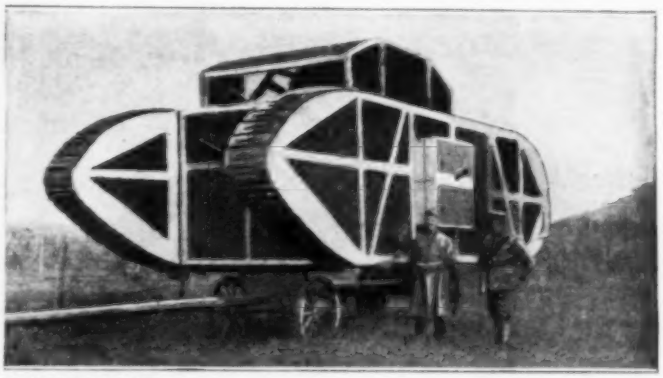


PHOTO BY FRANK F. BIBLEY

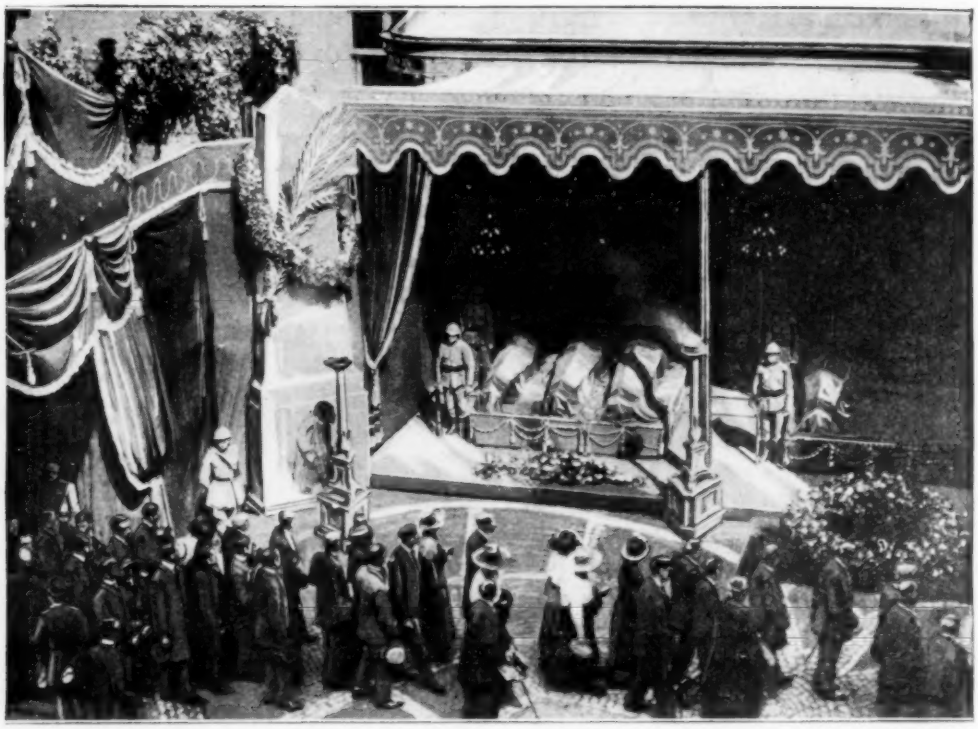
Imitation Tank Left by Retreating Germans in the St. Mihiel Salient, to Misguide Aerial Observers: With Its Stovepipe Artillery and Cheesecloth Armor It Probably Looked Very Formidable from the Air

---

NOON-HOUR BAND CONCERTS FOR SHIPYARD WORKERS

Encouraged by their employers, who believe that music furnishes inspiration for better work, skilled laborers in a Pacific-coast shipyard have formed a 30-piece band which entertains an appreciative audience of shipbuilders every day at the noon hour. The musicians are led by a fellow workman, who, like the remainder of the organization, appears at the concerts in his working clothes. So enthusiastic are the bandsmen that often they do not stop to remove the grime of toil from their hands and faces before taking up their instruments. Increased efficiency has been noted in the shipyard force since the entertainments were started.

Though Not Nattily Attired, This Band, Composed of 30 Skilled Laborers, Inspires Workmen in a Pacific-Coast Shipyard to Greater Efficiency by Playing Every Day at the Noon Hour. Their Efforts are Encouraged by the Owners of the Plant



BELGIAN MARTYRS HONORED WITH PUBLIC FUNERAL

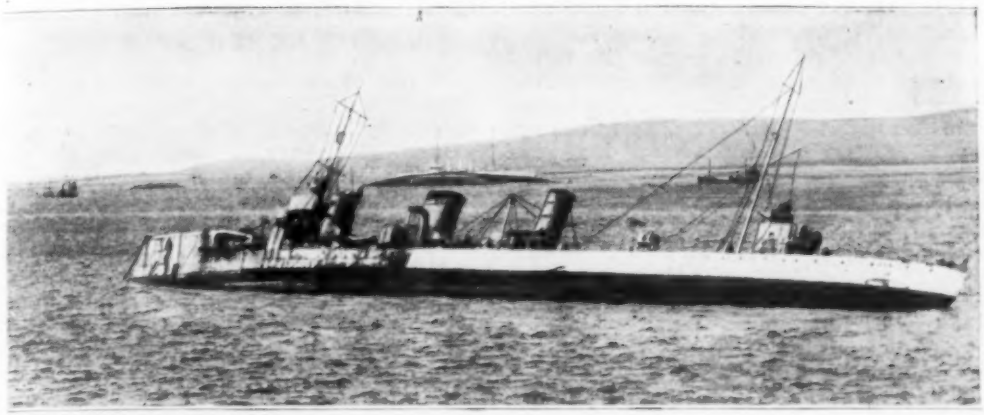
BELGIUM will not soon forget the ruthless cruelty of German occupation. Bodies of citizens, shot by the Germans for alleged offenses, were recently disinterred at Brussels and honored with a solemn public funeral. Guarded by the military, they lay in state on the steps of the ancient city hall, where thousands passed before them in silent tribute to their martyrdom. King Albert was present at the memorial services. Although the Belgian capital suffered less than most of the ravaged cities, proofs of the Hun's nauseating brutality were not lacking. Here fell Edith Cavell, whose body was exhumed several weeks ago for triumphant return to England and an interment befitting her heroic end.

PEACE MEDAL COMMEMORATES TREATY OF VERSAILLES

A peace medal of exceptional beauty and significance of design has just been struck off by an American society of numismatists. The design was selected by a committee from 15 submitted by prominent sculptors, and is the work of a young American artist. The obverse bears the figures of Peace, with palm branch and wreath; Justice, still helmeted but with sheathed sword, and between them the Pegasus-mounted form of Righteousness in a league of nations. The reverse bears, within a wreath, the palace of Versailles and the sun breaking through the clouds of war. The inscription reads "Peace of Versailles, 1919," and the name of the society. The medals are in silver, for members only; and in bronze, for general distribution.

Commemorating the Signing of Peace at Versailles, This Medal was Designed by a Young American Artist for the American Society of Numismatists

¶Several solders for use with aluminum have been produced in Switzerland, as a result of the increased use of this metal in place of copper, which is still scarce. One of these has a melting temperature of 632° F., while others melt at 438° F., 560° F., and 531.2°, respectively. Perfect union of aluminum pieces is obtained by their use, it is said. The materials were discovered after many experiments.



COPYRIGHT, INTERNATIONAL FILM SERVICE

Scene on Scapa Flow, the Great Naval Basin in the Orkney Islands, Shortly After the Interned German Fleet had been Scuttled by Its Crews: The Destroyer in the Foreground is Resting upon a Sunken German Ship and was Thereby Saved from the Fate of the Others

SINKING OF GERMAN WARSHIPS GREATEST SCUTTLING FEAT

When the German crews left in charge of the surrendered fleet, interned among the Orkney Isles, succeeded, on June 22, in sinking eight battleships, five battle cruisers, five light cruisers, and 28 destroyers, besides beaching and damaging a number of others, they accomplished the greatest feat of scuttling in history. Under the very guns of the guard ships, whose officers apparently had not yet realized the depths of Hun treachery, the sea cocks of the interned ships were opened, and the fleet, flying the German flag, sank slowly in the Scapa's depths. Some 5,000 members of the crews were all either captured, or—in a few cases—shot when they failed to surrender. It is stated that the sunken ships will form, unless salvaged at great expense, a serious impediment to the further use of Great Britain's naval base on Scapa Flow.

HUMAN BODY FORMS CUSHION FOR FALLING WORKMAN

A human body acted as a cushion to save from serious injury or death one of two building washers who fell 40 ft. from a suspended scaffold in a western city recently. The accident occurred while the men were working at the third story of an office building. A chafed rope parted, releasing one end of the platform, and the pair plunged to the concrete sidewalk below, the man who had been sitting nearest the end of the scaffold striking the hard surface first. His injuries were such that he died almost instantly, but his companion, who alighted on top of him, was only slightly hurt. Though the sidewalk was crowded at the time of the tragedy, no pedestrian was injured.

One Man was Killed by Falling from a Suspended Scaffold When a Rope Broke. His Companion Escaped Serious Injury by Falling on Top of Him

LIGHT MILITARY RAILROADS SUITABLE FOR BRANCHES

Portable railroads, such as were used in the war, have been suggested as suitable for branch lines from regulation tracks into sparsely settled regions, where more costly construction could not be made to pay, and for paralleling improved highways to care for such freight as cannot be carried conveniently in trucks. In the latter case, the tracks could be laid be-

fore the highway was improved and used for hauling material necessary for that work. To develop the plan to its fullest extent would mean building feeder lines from the railroads of today to every mine and farm in the country. The tracks are light, can be laid quickly, and require little roadbed.

SHORTENING FIRE TUG SAVES ENGINEER'S SALARY

By shortening a fire tug approximately 3½ in., the municipal authorities of a Pacific coast city considerably lowered

Shortening This Fire Tug Three and One-Half Inches by Planing Off the Craft's Cutwater Saved a Western-Coast City a Second Engineer's Salary

the cost of operating the vessel. Under the law, a boat of this type, which is over 65 ft. in length, is required to carry two engineers. As salary provision had been made by the city for but one engineer, there was more than a little consternation when it was discovered that the builders of the tug had completed it with a length of 65 ft. 3½ in. After a careful examination of the craft, it was learned that the offending 3½ in. could be removed from the cutwater without affecting the lines or efficiency of the boat. One engineer travels on the shortened tug, while the salary of a second remains in the city treasury.

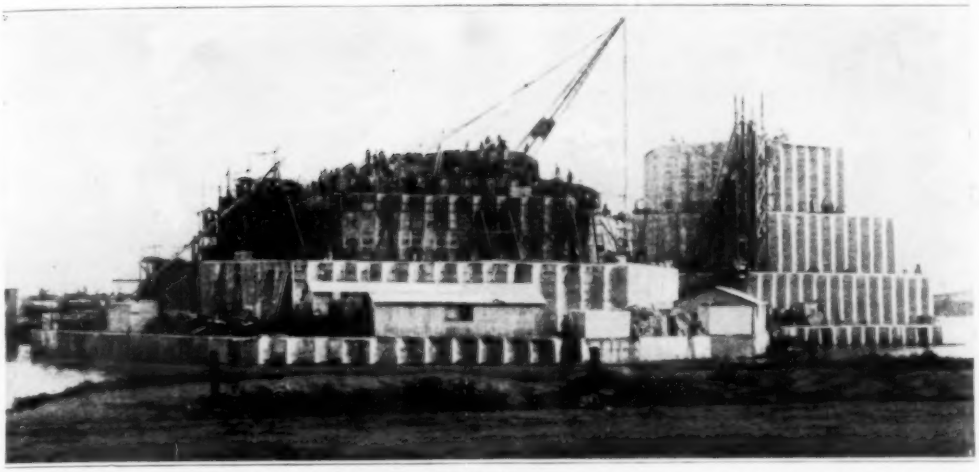
DIRIGIBLE BLOWN HELPLESSLY ABOUT NORTH ATLANTIC

A tale of hair-raising adventure in the busy days of July, 1918, has just been disclosed by officials of the Navy Department. The story is about two ensigns and a machinist's mate who put to sea from Chatham, Mass., in the nonrigid dirigible "B-12" under orders to hunt for German submarines, then lurking in our coastal waters. In their car was a heavy cargo of bombs, but little food and less water. In attempting to escort a transport in mid-afternoon the rudder broke. A sea anchor was thrown overboard, but the towline parted, and the craft was at the mercy of the stiff north wind. At 8:30 p. m. a gasoline pipe snapped, emptying the tanks and so lightening the craft that it soared to 3,000 ft. At that level it was blown northward all through the night, all next day, and all the following night. Food and drinking water were gone. On the morning of the third day the worn crew decided to take a desperate chance at rescue, so brought the bag to the water. Luck was with them. A steamer picked them up, more than 300 miles from their starting point.

REVOLVING GARDEN SHELTER PLACED ON MARKET

While the idea of a revolving shelter is not a new one, it was not commercialized until recently, when an English firm placed on the market several different designs and sizes of these houses. Placed on a base that permits the entrance to be turned toward the sun on bright days, away from the wind or rain on other days, the shelter is recommended for health as well as pleasure.

This Revolving Shelter is Recommended for Fresh-Air Treatment of Tubercular and Nervous Patients



Two of the Concrete Ships to be Used by the British Admiralty in Salvaging Craft Sunk by Submarines during the War are Shown in This Picture. Submerged Alongside a Wreck, They are Expected to Float the Sunken Vessel, When They are Pumped Out and Rise to the Surface

UNUSUAL CONCRETE SHIPS BUILT FOR SALVAGING

Concrete ships of extraordinary design are being built for the British Admiralty to be used in raising merchant vessels sunk by the Germans near the coast of the United Kingdom. On a broad foundation, shaped like the hull of a ship, are placed a series of towers, constructed of hollow blocks, and reinforced in such a manner as to be able to withstand great internal pressure. The towers are provided with water-tight doors and pumps. These unusual vessels are to be towed to the location of a sunken ship, and lowered on either side of the wreck. Divers will then attach them to the wreck. When they are pumped out, they are expected to rise to the surface, carrying the wreck with them. Their cost is in the neighborhood of $5,000,000 each. German war vessels sunk by their Teuton crews in Scapa Flow may also be reclaimed by the use of these salvaging ships.

¶ The air service of both army and navy have adopted a new distinguishing insigne for air craft, formed of a red circle inside of a white star, surrounded by a blue circle.

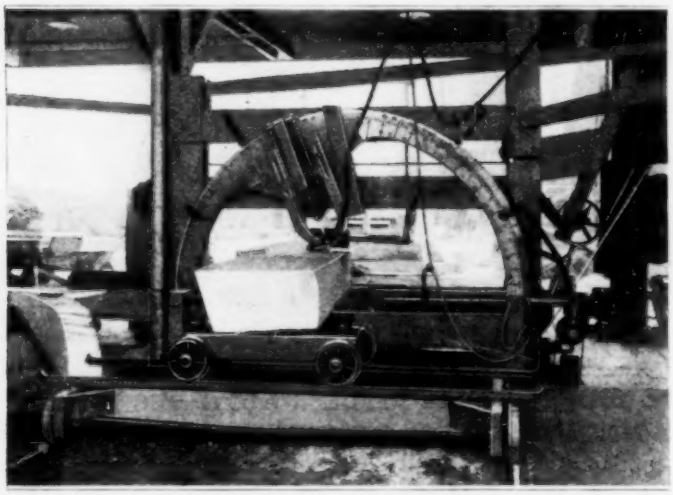
LIGHTLESS AUTO BUS IS RUN ON FROZEN ALASKA TRAILS

When the people of Anchorage, Alaska, recently awakened to the fact that the city had outgrown the dog-sled stage, and needed modern transportation, the problem looked difficult. Arctic trails have not yet joined the good-roads movement. Local business men were convinced, however, that a good auto could handle the situation. They ordered a motor truck, with a body fitted to carry 16 passengers and their baggage. So, now, at all hours of the 24, the ultramodern vehicle may be seen moving rapidly and surely along the paths formerly given over to the malemute and his sled. The bus carries no lights.

This Auto Bus Is Peculiar, in That It Has No Lights. The Car Works 24 Hours a Day Carrying Passengers over Alaska Trails

MACHINE DRILLS BIG SHIP TIMBERS AT ANY ANGLE

A huge protractor, forming part of a drilling machine installed at a western shipyard, solves the problem of boring holes at various angles in heavy ship timbers. The power-driven auger is mounted on the rim of the protractor, which is supported by rollers and turned with a handwheel. The timbers, brought to the machine on a wheeled carriage, are fed by power rollers directly through the big circular scale, which is adjusted to any desired angle. The machine is stated to accomplish 50 times the work of the old hand auger.



Drill Mounted on Huge Protractor, Which is Turned at Any Angle Desired by the Handwheel at the Right, While Power-Driven Rollers Feed the Work to the Auger

PURIFIED SEWAGE WATER USED IN BRITISH MILLS

The urgent need of additional water supply has induced the authorities of Sheffield, England's busy steel center, to sanction an innovation in water engineering. In the past, several million gallons of fresh water from the city's reservoirs have been turned into the local streams daily to compensate the owners of mills along the river banks for water taken by the city waterworks. Under the new scheme purified sewage water is to do this work, releasing the virgin supply for other purposes. The novel project is believed to be attended by certain dangers, but is judged to be worth a thorough trial.

THREE-MILE TRAIN OF TRUCKS WINDING ACROSS CONTINENT

Individual car owners still consider it quite a feat to cross the continent, even with good hotel accommodations every night. Yet the 3,000-mile run is now being negotiated by an extraordinary train of military trucks, that stretches out over three miles of Lincoln Highway. Standard army trucks, ambulances, kitchens, anti-aircraft wagons, and searchlight carriers, to the total of 60, make up the big train. The schedule specifies not less than 75 miles a day, at about 15 miles an hour, and the crew of 200 or more men and officers will live wholly in the vehicles for the entire trip. Its purpose is to recruit for the Army Motor Transport Corps, and to demonstrate the country's need of an extensive system of military roads and heavy bridges.

CADDIES' GOLF-BALL TRADE STOPPED BY SIGN

Resentful grimaces doubtless are made by Filipino caddies when they pass a certain sign on a golf course near Manila, as it seriously interferes with their traffic in golf balls, once a source of considerable revenue. The sign warns players not to purchase balls from the youthful attendants, intimating that the practice causes the boys to search less diligently for lost spheres, and requests that caddies offering balls for sale be reported.

Filipino Caddies on a Golf Course near Manila Dislike This Sign for Obvious Reasons

LOS ANGELES PARADES "ACE OF ACES" IN FLORAL AIRPLANE

A FLORAL airplane was a clever feature of the homecoming celebration with which Los Angeles honored Eddie Rickenbacher, America's "Ace of Aces." More than 100,000 blossoms are said to have been used in covering this replica of his fighting "Spad." The famous "Hat-in-the-Ring" insigne was not forgotten. Behind the float followed a procession two miles long. At the final reception in Rickenbacher's honor he was presented with an unusual diamond ring, the great stone in the center being surrounded by four aces, and the whole inclosed by 26 stars, one for each German opponent vanquished.

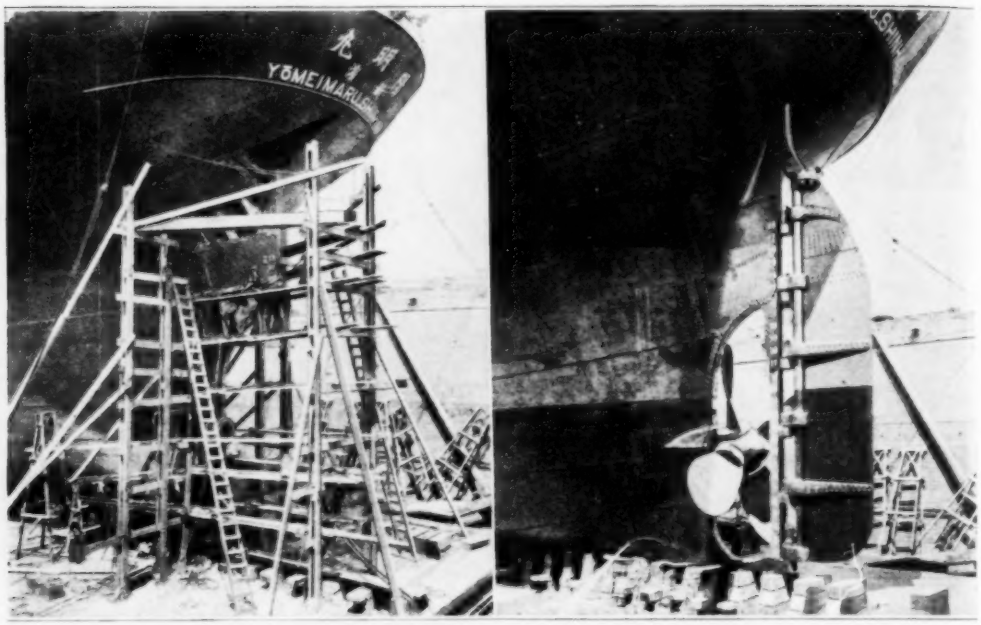
SWEDISH STEAMSHIP CAPTAIN DISSECTS FLOATING MINE

Floating mines set adrift by the Germans during the war still menace shipping on the Baltic Sea. Though dodging these instruments of destruction has become almost a habit with commanders of vessels navigating the northern waters, the captain of a Swedish steamship that recently reached the United States after a voyage from Gothenberg, Sweden, not only stopped to pick up one of the dangerous contrivances, but dissected it on the deck of the steamer. The high explosive in the mine, 300 lb. of it, was dumped overboard by the curious officer, and the shell was delivered to the British naval authorities.

¶Electrification of the suburban railroads of Berlin has begun, in spite of the post-war conditions in Germany. Coaches on hand will be converted for use under the new system. When traffic is light it will be possible to divide the standard trains of 12 coaches into two trains of six coaches each, as the larger trains are driven by motors at either end.

VENTILATED FRUIT CLOSET UTILIZES WASTE SPACE

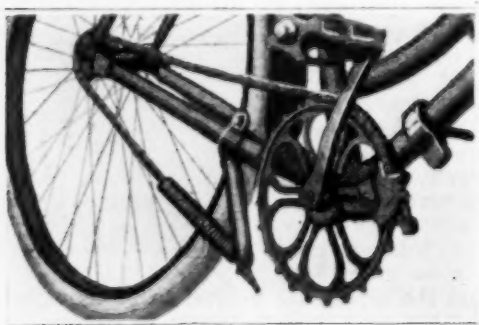
Canned fruit and other foodstuffs requiring coolness and darkness for preservation are kept by an Ohio woman in a ventilated closet, which cost little to construct, and which occupies space formerly wasted. The closet was built over the refrigerator, which stands in a narrow pantry, and is provided with double doors. Ventilation was obtained by connecting the compartment with an unused chimney, which allows cool air to enter. In use the closet has proved to be as satisfactory as a cellar, except in extremely cold weather, when the temperature inside of it sometimes falls to the freezing point.



Considerable Interest has been Aroused by the Speed of the Repairs Made Recently on the Japanese Liner "Yomei Maru." Rudder and Rudder Post had to be Replaced, a Difficult Task, as may be Judged from the Photograph at the Left. Numerous Heavy Plates and Hundreds of Rivets First had to be Removed. The 32-Foot Rudder Was in Place, as Shown at the Right, in Less Than Half the Expected Time

BROKEN CHAIN ADAPTS BICYCLE TO ONE-LEGGED RIDERS

From France, the home of innumerable crippled war veterans, comes an ingenious arrangement by which the bicycle is adapted to the one-legged rider. The chain is cut, one end being secured to the pedal sprocket, the other to a coil spring from the lower frame. The usual rotary motion of the pedal, so difficult for the one-legged person to maintain, is thus transformed into an up-and-down movement. A rubber check on the frame arrests the pedal in the upright position at the end of the pullback by the spring.



BY COURTESY OF LA NATURE

This Pedal Arrangement with Up-and-Down Motion is Designed for the One-Legged Bicycle Rider

PACIFIC SHIPYARD HANGS UP NOTABLE REPAIR RECORD

The steamship "Yomei Maru" recently limped into Puget Sound with its 32-ft. rudder and rudder post missing, torn away by a riotous Pacific storm. The job of replacing the lost parts would ordinarily have taken six weeks, as it involved the tedious task of cutting rivets and removing stern plates even before the actual replacement could be begun. But the shipyard which obtained the contract went after a record. Three crews of specialists completed the work in two weeks and five days, saving the owners of the "Yomei Maru" something like $40,000 in time otherwise lost. The record-breaking performance has brought inquiries from marine experts in all sections of the country.

SECTIONAL DITCH BOTTOM MADE OF CONCRETE

Intended to form a solid bottom for an open drainage ditch, portable concrete sections, designed by a Panama Canal sanitary inspector, have been giving satisfactory service for over a year in the Canal Zone. Each section is 30 in. long by 10 in. wide, and shaped like half of a tile split

longitudinally. Bell joints unite the sections, which are firmly fastened together by concrete poured at the joints of the union. While the sections are being leveled and the binding concrete is hardening, they are held together by steel pins inserted at the joints.

PLAN TO USE BATTLE FIELDS FOR GRAZING SHEEP

Sheep will be grazed on the former battle fields of Europe until such time as the war-swept regions are suitable for farming operations. At present the devastated portions of France and Belgium are covered with a luxuriant growth of grass, providing excellent sheep ranges. Plans are being made by agricultural relief organizations to donate flocks of British sheep to farmers who wish to return to their holdings in such localities.

MIDGET MONOPLANES SELL AT POPULAR PRICE

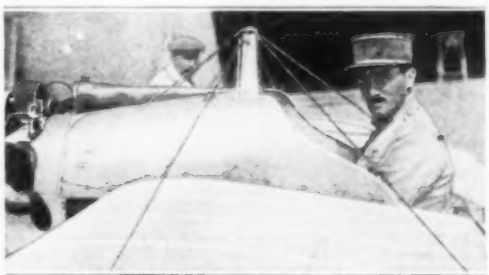
A reputable French firm is now offering the "Mosquito," a vest-pocket, single-seater monoplane, for $800. The wing span is only 13 ft. A horizontally opposed, twin-cylinder engine of 20 hp. is said to give it a speed of over 60 miles an hour. The pilot of the big "Goliath" machine, which travels weekly from Paris to Brussels, recently rose in the dainty little plane to a height of nearly 5,000 ft. On returning to the landing field he dramatically proved the lightness of the machine by taking the tail over his shoulder and dragging it to the hangar.

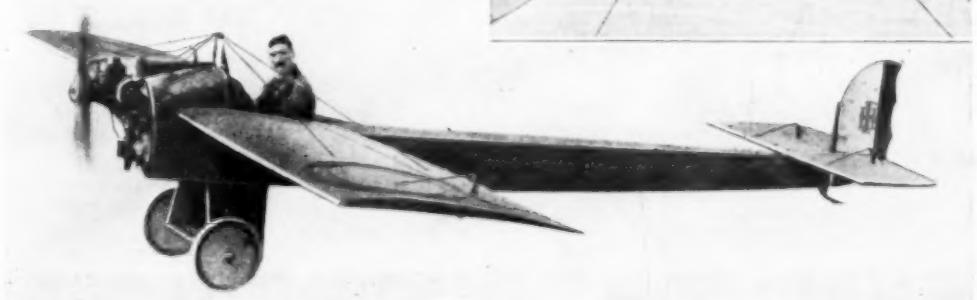
PACKING CASES FOR EUROPE BECOME KITCHEN CABINETS

An interesting bit of practical ingenuity will play its part in the reconstruction work of the Methodist Missionary Cen-

Supplies Sent by an American Relief Organization to Europe will be Shipped in Cases Easily Converted into Kitchen Cabinets

tenary, the hundred-million-dollar enterprise by which that church is celebrating the hundredth anniversary of its missionary activity. It has been decided that all supplies sent by the centenary to



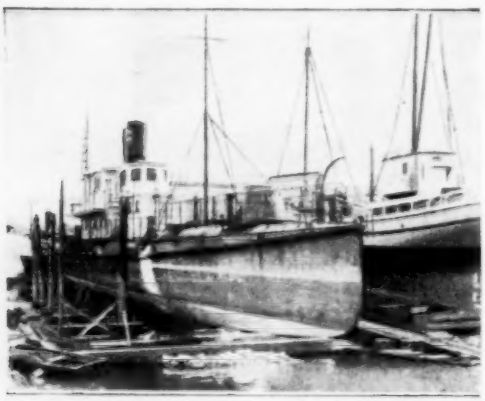


This Is a Little French Craft Called the "Mosquito," and Claimed to Be the Smallest Practical Airplane in the World, Its Wing Span Being Only 13 Feet. Above Is a Closer View of the Fuselage

the devastated areas of Europe will be shipped in transformable packing cases. Each case is of heavy construction, with a two-piece top which is pried off intact. This top is converted into two swinging doors by sawing through the crosspieces, and applying the hinges which are found inside. Three shelves are packed in each case, with cleats to hold them already nailed in place. A paintbrush and a can of mahogany stain are also included, enabling the recipient to change the case into a serviceable kitchen cabinet with no expense and a minimum of effort.

TORPEDO BOAT TRANSFORMED INTO HALIBUT TRAWLER

Obsolete as a vessel of war, the remodeled torpedo boat "Fox," which played



As a Fighting Vessel the Torpedo Boat "Fox" Helped Put down the Boxer Rebellion; Remodeled, It will Become a Halibut Trawler

a part in quelling the Boxer rebellion, in China, will soon leave Seattle, Wash., to ride the waves of the Pacific Ocean as a halibut trawler. Numerous changes are being made to fit the ship for its new purpose. Engines of late model have been installed in the trim steel hull, a peaceful-looking stack has replaced the rakish funnel of the fighting craft, and a new house has been built amidships. All of the equipment peculiar to a war vessel will be removed. The "Fox" was built in Portland, Ore., in 1899.

DANUBE RIVER MOTORBOAT OF SPECIAL DESIGN

Designed to overcome navigation difficulties peculiar to the Danube River, a motorboat of special construction was tested recently on that stream and found to be satisfactory. Below the water line the craft is a combination of the V-shaped and gliding-type boats, and as it draws only 1½ ft. of water, it is able to pass through shallow parts of the river. The boat is slightly over 26 ft. long, and about 5 ft. wide. It is propelled by a four-cylinder gasoline engine which develops 32 hp. Running with the current, it has a speed of 28½ miles per hour, while it travels 20 miles per hour in the opposite direction.

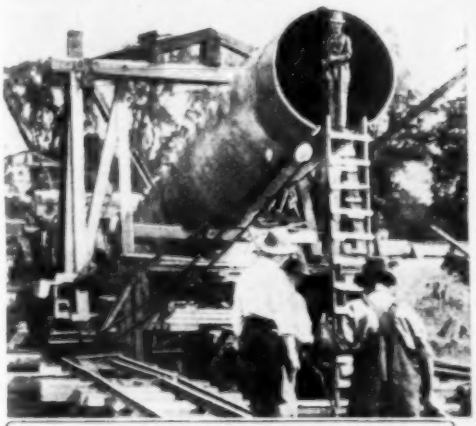
MAGNETIZED POWER PULLEYS PREVENT BELT SLIPPING

Magnetized pulleys for the transmission of power through thin iron or steel belts have been patented in France. Because of the attractive force of the wheels, the belts adhere tightly to them, and no power is lost through slipping. Windings in spiral slots on the surface of the pulleys are the source of the magnetism. Tests of the new system have shown it to be efficient, and especially suitable for use with high-speed turbines.

HUGE CONCRETED PIPE RAILROADED TO RIVER BED

An engineering feat of doubly unusual character was performed in the recent laying of a section of the Jersey City, N. J., water-pipe line. In its course to that city from Boonton, the pipe crosses the Passaic River at Nutley, the submerged portion being 500 ft. long and weighing about 1,000 tons. It consists of a 6-ft. steel tube incased in heavy reinforcing wire, and coated with cement-and-sand concrete, 4 in. thick, applied with a cement gun in the fashion employed in concrete-ship building. Two narrow-gauge railroad lines were laid on trestles across the river, with space between them for the pipe; and the supporting cradles were built on wheels resting on the rails. When the pipe section was finished, after three months' work, the whole structure was rolled to a position above the river. Then, by careful unwinding of the supporting cables, aided by mounting spirit levels in the center and 50 ft. from each end, the big pipe was lowered to the river bed without a hitch.

Two Railroad Trestles were Laid across the River, with Space Enough between Them for Lowering the Big Pipe into the River. When the 500-Foot Section had been Coated with Concrete, It was Moved across the Stream, Supporting Cradles and All, and Sunk



Close-Up View of the Cradle Construction: The Big Pipe Rested in Cradles Hung from Heavy Uprights, Which Stood, in Turn, on Small Railroad Trucks

The Huge Steel Pipe, Six Feet in Diameter, was Coated with Concrete Four Inches Thick, Applied with a Cement Gun over Heavy Wire Reinforcement. The Gun Was of the Type Usually Employed in Concrete Ship Construction

CAUTIOUS DRIVING URGED BY SIGNS ON CARS

A successful campaign against careless automobile driving is being conducted by a motorists' club of Seattle, Wash. Not

Reckless Automobile Driving is Discouraged in Seattle, Washington, by Polite Suggestions Carried at the Rear of Cars Belonging to Members of a Motorists' Club

only do the members of the organization report to the police all violations of traffic regulations noticed by them, but they carry reminders of the need for caution with them on their cars. A metal plate fastened below the license-number tag bears the proposal, "Let's Drive Carefully," in letters large enough to be read by the driver of a car some distance behind. As the club has nearly 1,000 members, it is expected that the movement will produce the desired effect.

SIMPLE HOVER INCREASES EFFICIENCY OF HENS

A large brood of chickens may be cared for by one hen with a simple, recently patented hover. It consists of a square platform, supported a few inches above a base of similar size by pillars at each corner. In the center of the platform is a hole of the correct size to accommodate a seated hen, with a passage leading to the hole from the edge of the platform. Strips of cloth are suspended from the edges of the platform, hole, and passage.

Iron may be rendered rust-proof, it is claimed, by a process recently discovered by a Swiss scientist. Treated while red-hot with superheated steam, the iron receives a hard coating of black iron oxide. If the temperature of the iron is raised to 1,422° F. and the treatment continued for six or seven hours, a harder and more durable coating is obtained.

SHIPYARD SUCCEEDS IN CUTTING BUILDING COSTS

The Puget Sound Navy Yard has succeeded in reducing appreciably the cost of building ships. From Nov. 24, 1918, to April 24, last, the unit cost of driving rivets was cut in two. On ammunition ship "No. 1," official records show, the labor cost of each rivet driven was 16.5 cents in November. In April it was only eight cents.

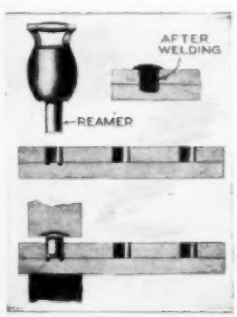
The head of construction at the yard, in commenting on the new records, attributes the result to a careful selection of workmen, with the slow and incompetent weeded out; to the fact that the crews have become experienced and skilled, and, more notably, to the intense loyalty of the yard employes, who are as anxious to stand high in the eyes of Washington as is the commandant himself. The record of rivets driven for five months on the ship mentioned is as follows:

	Rivets Driven	Labor Cost	Unit Cost
Nov. 24 to Dec. 23	107,270	$17,687	$.165
Dec. 24 to Jan. 23	108,660	15,737	.145
Jan. 24 to Feb. 23	131,070	16,069	.123
Feb. 24 to Mch. 23	160,495	17,069	.106
Mch. 24 to Apr. 23	148,108	11,948	.080

The riveting cost on several seagoing tugs constructed at the yard has always been small, ranging as low as six cents, due to the lightness of construction.

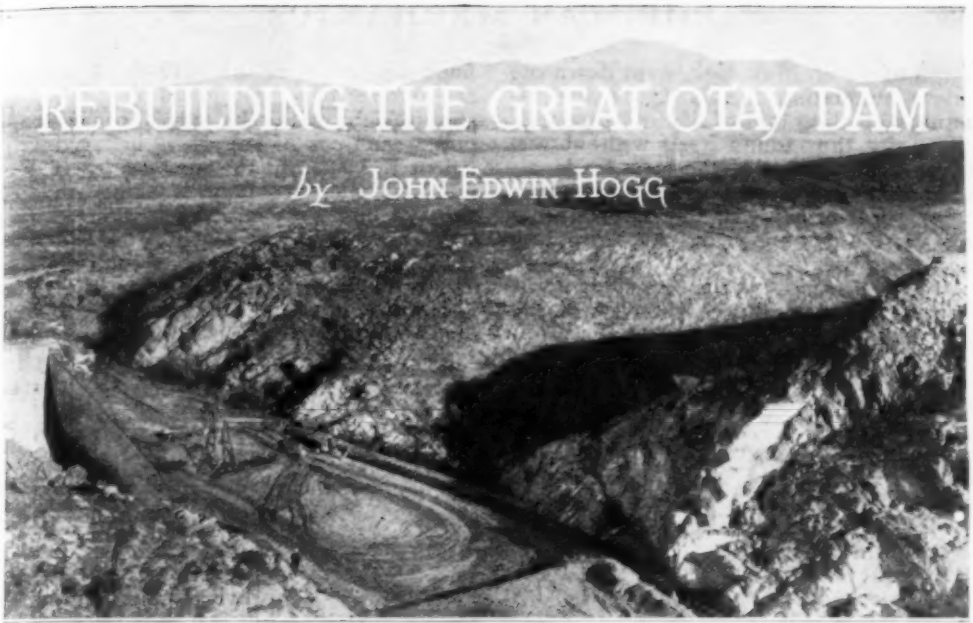
ELECTRIC-WELDING PROCESS JOINS METAL PLATES

A new method of joining metal plates requires rivet holes in but one of the plates, the inserted rivets being welded to the other plate by the electric process. Superimposing the perforated plate upon the other, a tool passed through the holes cuts a circular groove on the surface of the lower plate. A rivet, preferably tapered, is inserted and butted against the projection left within the circular groove; from dies, above and below, a current quickly renders plastic the rivet and projection at the point of restricted contact, so that the application of pressure welds the metal together.



REBUILDING THE GREAT OTAY DAM

by John Edwin Hogg



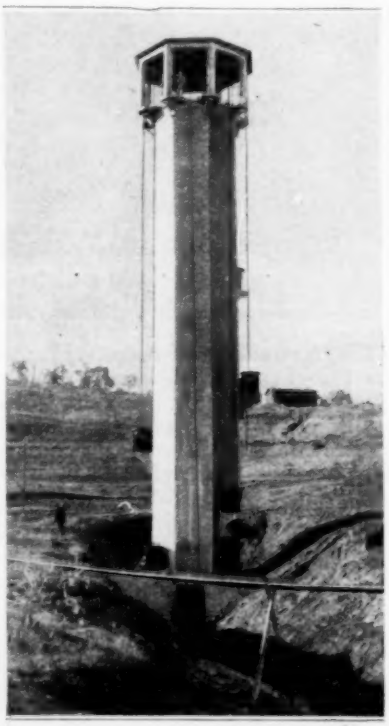
Beginning Excavation Work for the Reconstruction of the Great Otay Dam, Destroyed by Flood in 1916: Portions of the Abutments of the Old Dam Still Are Visible. At the Foot of the Tall Mountain in the Distance Lies the Upper Otay Reservoir

WHEN the city of San Diego, Calif., in 1897, erected the Otay Dam across the narrow cañon outlet of the Otay Valley as a means of supplying the city with an abundance of water during the arid season of the year, the world looked upon it as a masterpiece of engineering construction. Not only did this dam take care of the city's requirements, but it made possible the cultivation of some 30,000 acres of formerly undeveloped land. The original dam was 500 ft. long, and 150 ft. high. It was of stone and concrete with a sheet-steel core. In January, 1916, rain fell in the Otay watershed at the rate of half an inch an hour for 48 consecutive hours without a stop. By this time, the Otay spillway was discharging 32,000 cu. ft. per second with the water in the reservoir continuing to rise. Then the dam burst.

The Impounded Waters of the Otay Valley will Form a Lake Six Times as Large as This When the Dam is Completed. At the Right may be Seen the Auxiliary Spillway, Provided to Take Care of Flood Water

A wall of water, 75 ft. high, went down the cañon, inundating the lowlands and inflicting appalling loss of life and property.

The city thus found itself without water, and the owners of the farm lands, already financially ruined by the flood, faced the prospect of being unable to produce a crop for the coming year. Accordingly a bond issue was floated for $750,000, to begin the construction of a new Otay Dam of colossal proportions compared with the one destroyed by the flood. Work on the new dam began in October, 1917, and was temporarily suspended in August, 1918, the suspension being partly due to politics, but also to the difficulty of securing materials and labor during the war. Construction with city forces was authorized in September, 1918, and the work was renewed. This was made possible partly by the fact that 85,000,000 bbl. of cement had been purchased and delivered on the grounds during the early stages of the work.

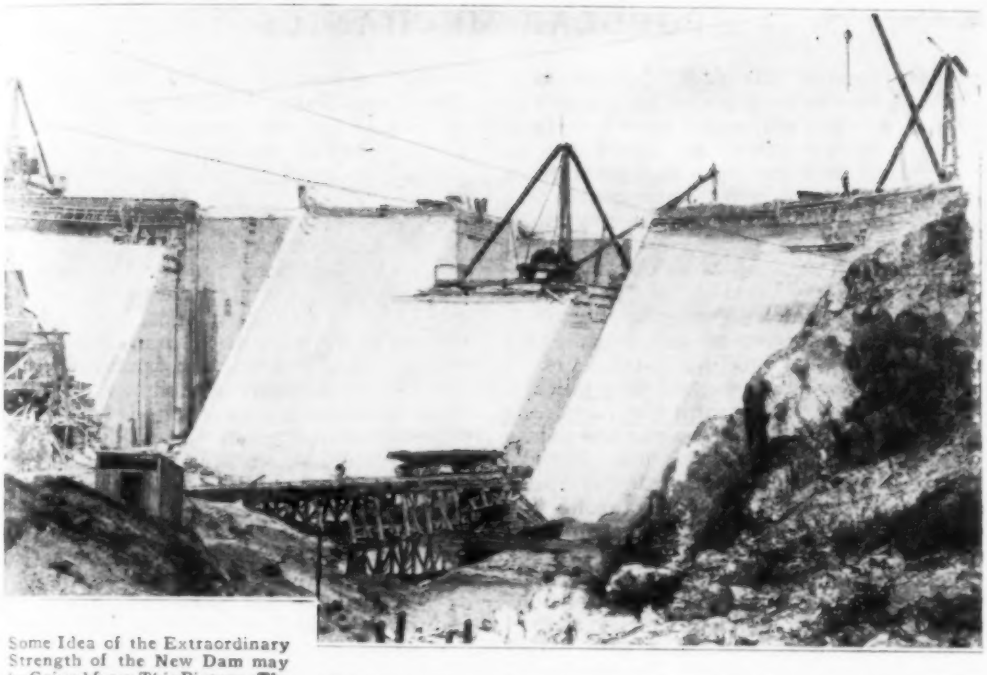


Intake Tower of the New Reservoir, 80 Feet High and Provided with Seven Intake Pipes at Various Levels: The Flood Water will Reach the Upper Balcony

The new dam, when completed, will be 200 ft. high. It is 150 ft. thick at the base, and 750 ft. long at the top. The foundation goes down to bedrock, which fortunately was close to the surface of the cañon floor, and composed of an exceptionally fine and hard blue rock. The dam is being built of cyclopean masonry, which, when completed, will have a total weight of 170,000 tons, equivalent to a bulk of some 80,000 cu. yd. The reservoir to be formed by the new dam will store 50,000 acre-feet of water, or approximately 16,000,000,000 gal. This quantity, it is anticipated, will be sufficient for all the city's needs and also for irrigation for many years to come. At its present stage, the Otay Dam is 87 per cent completed. Its completion and formal dedication is expected to be accomplished by the beginning of September next.

The finished part of the dam now confines a portion of the 1919 flood waters, the amount being estimated at 650,000,000 gal., which, with the city's other temporary sources of supply, is believed sufficient to last until the next rains. Three hundred men are now working on the dam 24 hours a day, in eight-hour shifts. They are putting in masonry at the rate of 275 cu. yd. per day. The total freight hauling necessary to complete the dam is only about 25,000 tons, due to the fact that the supply of fine rock from which the dam is being largely constructed is locally available by blasting down the walls of the cañon.

The extraordinary conditions existing at the Otay Dam make the structure distinctly different from any other similar engineering feat ever attempted. It must be taken into consideration that the dam must stand a series of floods which, during about four months of the year, attack it with about ten times the normal rainfall of a watershed of the same size located in the middle West. It is built to stand a strain of discharging 50,000 cu. ft. of water per second, which is 18,000 cu. ft. per second greater than the flood of 1916, the greatest on record. It is obvious that the shedding of this volume of water cannot be accomplished without involving certain engineering difficulties. Chief among these was the problem of getting rid of such a volume without damaging the structure itself. To accomplish this, flanges of masonry, 15 ft. long have been built at the mouths of the spillways. These are designed to direct the flow away from the abutments and walls, sending it in a straight line down the cañon. While the bedrock on which the dam is built was exceptionally solid, it was nevertheless not without the usual rock seams, and these were considered a possible cause of trouble, once the terrific pressure of the water began working on them. So, to



Some Idea of the Extraordinary Strength of the New Dam may be Gained from This Picture. The Gate Spillways are Provided with Flanges Calculated to Direct the Flow of Flood Water Straight down the Center of the Cañon, and Away from the Abutments of the Dam

The Little Town Visible Here Is the Colony of Workmen Engaged on the Construction of the New Dam. Provisions are Supplied at Cost, a Theater Provides Entertainment, and the Children Have a School, While Sanitation and Safety are Promoted in Every Way

---

The Upper Otay Dam, Which Withstood the 1916 Flood, Impounds Some 20,000 Acre-Feet of Water Five Miles above the New Dam; but Even if It should Break, It is Calculated That the Lower Dam, with Its Great Strength, would Hold the Flood without Difficulty

prepare against this danger, holes were drilled into the rock seams to a depth of 20 ft. Two-inch perforated pipes were then inserted in the holes, and liquid cement was forced into the pipes at a pressure of 250 lb. per square inch. This process was continued until every seam was thoroughly sealed.

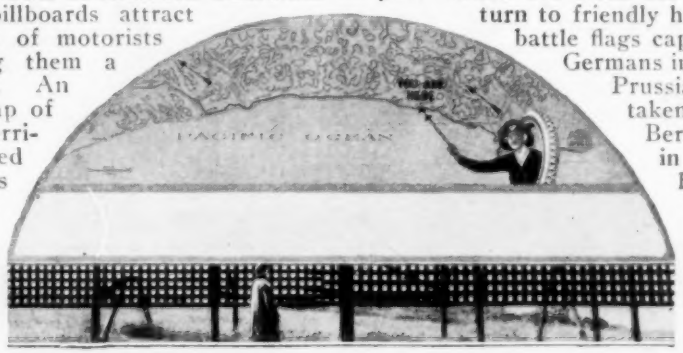
An interesting feature in the construction of the Otay Dam is the cable tramway above it which is used for the hoisting and transporting of materials. This cable way carries building materials of all sorts, five tons at a time and very quickly. It is also used for moving the numerous derricks used on the job to various points where they are needed. These derricks weigh 28 tons each, yet by the overhead cable hoist they are moved from one side of the dam to the other, to the top of it, or onto the cañon floor. The average time consumed in moving one is 10 minutes. To move one by the usual methods would require a week.

Thus far no employe has been killed during the work, owing, no doubt, to the adoption of effective safety measures. Thus all rocks and material used in the construction are hoisted in skips instead of in chains—the usual practice; employes are penalized for carelessness that might cause accidents, and classes in safety engineering are held once a week. The Otay Dam, located 22 miles east of San Diego and about 12 miles north of the Mexican boundary, is only 400 ft. above the level of the city. This fact, coupled with the irregularity of the water flow, eliminates the possibility of developing hydroelectric power.

Living conditions among the men of the dam camp are ideal, and sanitation is excellent. Temporary houses have been erected to care for their home life. Men who are married or have families live in houses by themselves, and are supplied with provisions and supplies from the camp commissary on the basis of cost. Single men live in the camp dormitory, which is arranged like a big hotel, and board at a camp mess hall very similar to that of the average army camp. These men are boarded on the basis of actual cost, and each one receives that amount over and above his wages. A school is maintained for the children, and there are elaborate entertainment features for the men and their families. There is a motion-picture theater, and once each week a vaudeville performance is given by actors brought out for the occasion. There are also two churches where Sunday services are held, one Catholic and one Protestant.

BILLBOARDS MAP LOCALITY FOR MOTORISTS

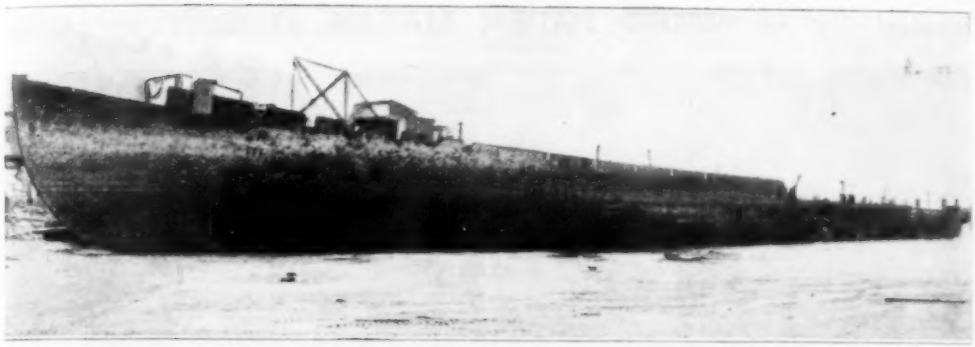
Along the roads of southern California advertising billboards attract the attention of motorists by rendering them a real service. An enormous map of the local territory is carried and Miss "Lotta Miles" points out one's exact position on it. These boards are met with at intervals of a few miles. The visiting motor tourist, to whom local roads are unfamiliar, is likely to entertain a lively sense of gratitude toward the kindly advertiser who combines such useful information with the announcement of his wares.



When the Auto Driver Touring Southern California Roads can Consult One of These Maps on a Wayside Billboard Every Few Miles, He Has Little Excuse for Asking Questions

GERMAN RIOTERS DESTROY FRENCH BATTLE FLAGS

Just before the time set for their return to friendly hands, French battle flags captured by the Germans in the Franco-Prussian war were taken from the Berlin museum, in which they had been since 1870, and destroyed before the statue of Frederick the Great in Unter den Linden. It was provided in the peace treaty that the flags should be returned to France. A mob led by a German officer seized the flags, which were packed for shipment, and carried them to the statue where they were burned or torn to pieces.



This Battered Hulk Was Once the Steel Yacht "Mariechen," One of the Handsomest Vessels in the German Merchant Marine. It was Wrecked in the Pacific Several Years Ago, Abandoned, and Finally Washed Ashore in Puget Sound. It is Now being Cut to Pieces with Oxyacetylene Torches and Carried to a City Junk Yard by Auto Truck

OLD GERMAN YACHT CUT UP AS RUSTY JUNK

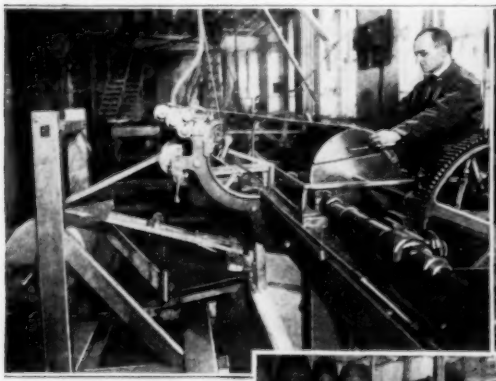
An air of almost human tragedy hangs about the stanch old ships which have sailed their last voyage and now forlornly await destruction on some lonely beach. On a mud flat on Puget Sound lies one of these unfortunates. Christened the "Mariechen" by a German princess in Hamburg, 19 years ago, it started its career as a graceful, all-steel private yacht. Then it toiled for years as a humble freighter, to be wrecked at last, abandoned, and washed ashore. And now the last chapter is being written by a junk dealer. Toiling in the depths of the hull when the tide is out, and in the upper works when the tide is high, his workmen are cutting it up with oxyacetylene torches.

ARTIFICIAL JOINT INVENTED BY SPANISH SURGEON

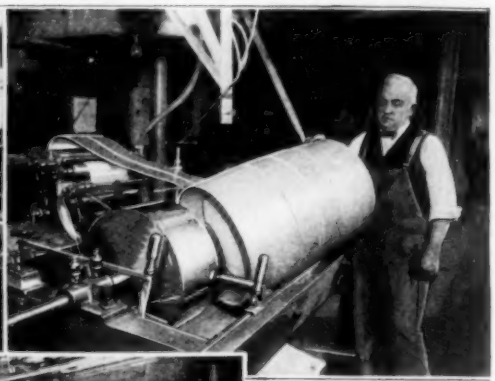
An artificial joint which is proposed as a substitute for natural articulations that have become stiffened through injury or disease has been invented by a Spanish surgeon. Gold and platinum are used in making the device, which is in principle a ball-and-socket connection. The ball, a solid sphere of metal, is mounted on one of two similar plates, while the socket, a hollow sphere of the same material, is mounted on the other. When these parts are fitted together they form a joint that can be moved freely. On the reverse side of each plate are fastened four arms for bending back over the end of a bone. Wires carried in tunnels in these arms are used to bind the sections in place.

The Wreckers with Their Oxyacetylene Torches Find It No Easy Task to Cut through the Heavy Steel Frames and Bulkheads of the "Mariechen." The Steel Sides are More Easily Salvaged, being Cut into Plates, Each Two Feet by Five Feet

STRIP OF GUMMED PAPER MAKES STURDY BARREL



The Strip of Gummed Paper is Here being Wound on the Revolving Mold or Core



The Paper Barrel has been Wound and is Now About to be Taken off the Shaping Machine

These Are the Paper Barrels and Tubs as They Come from the Shaping Machine. With the Addition of Wooden Tops and Bottoms They Are Ready for Service

Barrels which are said to be ideal for the transportation of fruits and vegetables are now made from paper. The process is simplicity itself, involving only a strip of gummed paper which is rolled into shape upon a metal core, and completed by the addition of a wooden top and bottom. On the shape of the core depends the form of the barrel, tub, or other receptacle wound upon it by the shaping machine, hence by changing cores the machine may be quickly adapted to the manufacture of any style of barrel. The barrels produced in this way are extremely light, yet surprisingly rigid and durable. They are quite sanitary, too, as the absence of cracks prevents the entrance of dirt and dust during railway travel and prolonged storage.

MOUNTAIN STATES RAISE BUMPER WHEAT CROP

EVEN the inter-mountain states, not previously marked by exceptional wheat-growing activities, are reporting bumper crops of the great cereal this season. Arizona, Idaho, and Utah particularly are striving to break all their former records, and apparently there is little doubt of their success. There are 32,000 bu. of wheat in the pile in the accompanying picture. All this raw material for the "staff of life" was harvested and sacked on a single farm, near Buhl, Idaho.

RADIUM IN SPRING WATER AFFECTS INSTRUMENTS

Radium is present in such quantities in the waters at Bath, England, that delicate scientific apparatus is seriously affected by emanations from the bodies of persons fresh from ablution in the hot springs. The gold leaves of an electroscope in a laboratory there collapsed when a man who had just bathed in the thermal waters came near the instrument, and could not be distended by the usual method, a fresh charge of electricity, until he had left the room.

TO NAVIGATE MISSOURI RIVER WITH AIR-PROPELLED BOATS

The treacherous Missouri River, with its disappearing channels, movable sand bars, and general unnavigability, is to be attacked from a new angle in a determined effort to make its mighty but wayward course useful to commerce. Big barges, drawing when loaded only eight to ten inches of water, will be equipped with air propellers, driven by gasoline engines. A mile ahead of each string of barges a small motor pilot boat will hunt the shifting channel and sound for obstructions, signaling the course back to the barge steersmen. With the experiment a success, huge deposits of lignite coal that lie along the river through the Dakotas will be made available, and the isolated country in the great valley, far from any present transportation, will find a way to market.

JUGGLER BALANCES ON FLIMSY PERCH HIGH ABOVE PAVEMENT

While his companions hugged the coping in a perspiring effort to keep their eyes from Herald Square, 25 stories below, "Dare Devil" Reynolds of New York City recently gave an unprecedented exhibition of juggling skill. He placed a kitchen table astraddle a corner chimney, and on the table two chairs, face to face. A third chair rested with two legs on each of these. A fourth chair he set at a slant against the back of the third. Then he climbed to the top of the rickety perch, stood upright, pulled three billiard balls from his pockets, and tossed them nonchalantly about, seeming to forget that a dropped ball would shoot down, and down, to a crashing finish on the pavement far below. The stunt completed to his satisfaction, he sat on the tilted chair, slowly stretched his feet over Herald Square, and balanced himself on two chair legs.

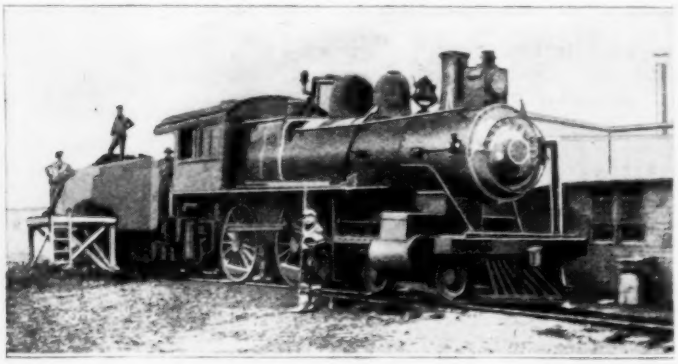
COPYRIGHT, UNDERWOOD & UNDERWOOD

This Is the Way a Juggler Gave Publicity to a Recent "Drive." He Went through His Tricks Just 25 Stories above a New York City Street

¶ The subject of accident prevention is considered so important by the Department of Labor that it has published a pamphlet, written by a government expert, in which are printed instructions on how to give an illustrated lecture on the subject. These pamphlets are being sent out to the larger employers, many of whom already have begun campaigns along this line.

LOCOMOTIVE KILLS "COOTIES" BY SUPPLYING LIVE STEAM

In preparation for the reception of returning soldiers, an eastern camp installed a complete steam and hot-water sanitary plant to discourage visiting "cooties." So popular and so necessary did this department prove that it was unable to keep up with the demand for its services. The resourceful engineers promptly laid a switch track to the railroad, several hundred yards away, and a locomotive was brought in alongside the sanitary station. With live steam piped into the building from this extemporaneous assistant, the task of execution was soon completed.



Locomotive Supplying Live Steam to a Military-Camp Sanitary Station to Help Out in a Rush Demand for the Execution of "Cooties": The Track was Specially Laid for the Occasion

CHEMICAL ODORS AS WARNING SIGNALS IN MINES

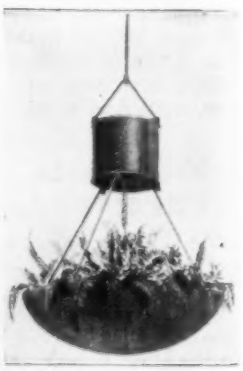
Scents from odorous chemicals may be used as warnings of gas leakages in mines, if a practical plan results from tests being made by the Bureau of Mines. Experimenters are using an "odorometer," which consists of several flow meters arranged so as to measure a stream of air that passes over or through the chemical being tested. Before the tests are made, this odorized air is mingled with a volume of fresh air, also measured. By comparing the weight lost by the chemical during the passage of the air through the apparatus and the volume of air into which the chemical has been vaporized, it is possible to determine the percentage of vaporized chemical in a given volume of air. Olfactory tests of the scented air are made by smelling and classifying as to strength of odor.

DISCOVER PEACE-TIME USE FOR CARTRIDGE CLOTH

Experiments have disclosed the fact that silk cartridge cloth, used by the army for making bags to hold the explosive charges of heavy artillery guns, may be rendered suitable for clothing and house decorations by a simple process, and an oversupply of 17,000,000 yd. of the fabric, possessed by the War Department at the cessation of fighting in Europe, is to be sold to the highest bidders. Cartridge cloth, as prepared for the army, is gray in color and impregnated with gum and oil. By boiling the cloth, it has been learned, these substances may be removed from the fabric, leaving it soft and smooth, and ready for dyeing or printing, though without sheen because of its heavy warp. The amount of cloth to be sold represents what was estimated to be a three months' supply for the artillery of the American expeditionary force.

FLOWER BASKET THAT KEEPS PLANTS ALWAYS WATERED

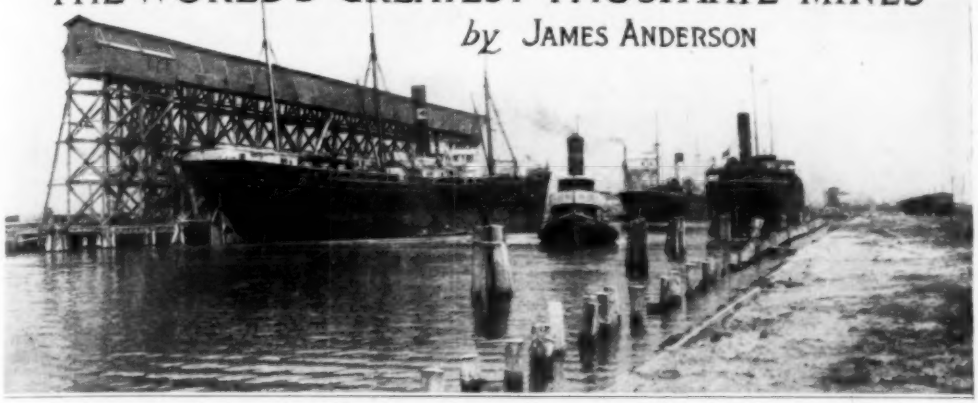
The burden of remembering to water the plants has been lifted. An English inventor has patented an irrigating can, from the bottom of which projects a tube with a wick or string in it, allowing just enough water to escape for proper moisture. The flower basket hangs from the can itself, which may be as ornamental as desired.



¶Among the unusual shipments carried by an aerial-transportation company operating between Paris and Brussels was a consignment of 500 live lobsters, dispatched from the former city to the latter by aeroplane.

THE WORLD'S GREATEST PHOSPHATE MINES

by JAMES ANDERSON



Tampa, Florida, has Become the Largest Shipping Port for Phosphate Rock in the World, with Facilities for Handling a Million Tons a Year. The Ocean-Going Steamers That Dock at Her Wharves Are Able by the Aid of Modern Loading Machinery, to Take on a Full Cargo in a Single Day and Depart before Night on the Voyage to the Markets of the World

TAKING account of stock is now one of the principal and vital occupations of the entire world. On every hand, in every land, merchants and manufacturers are preparing for the demands of the reconstruction period.

Back of this comes the figuring by governments, themselves, on the natural resources of the countries under their jurisdiction. Largely upon these resources the continued prosperity of any nation fundamentally rests. The country which has something to sell that all other nations require, but which they do not largely, if at all, possess, has, of course, a trade advantage.

Restrictions on international commerce during the war naturally threw every nation "on its own" to a very great extent, and focused attention on natural resources considerably more than was necessary in times of peace. In this country, some interesting "discoveries" were made when we came to stock taking; discoveries which were, in more than one case, entirely unexpected and of the greatest value.

Take one of those which may be said to have been made in Florida. Few Americans have ever looked upon that semi-tropical peninsula as a mining state of importance, and to many it will come as a surprise to learn that in one important mining product, phosphate, Florida today produces about 52 per cent of the entire world's supply, and about 82 per cent of the supply of the United States. Incidentally, these phosphate beds, underlying to a greater or less extent almost the entire surface of the state, are one of the great reasons for the wonderful productivity of Florida's soil.

PHOTOS BY GILLIAMS SERVICE

Prospecting the Sides of a Quarry Pit near Tampa for Deposits of Soft Phosphate, Outcroppings of Which are Commonly Observed in Such Locations

Although, of course, they have been known and worked for years, it was not until 1917 that the U. S. government really turned its attention seriously to the Florida phosphate mines, as one of the greatest of its natural assets. At that time, a general effort was being made to increase the production of phosphate rock, owing to the conviction that the people of the United States must greatly increase their production of foodstuffs. For intensive agriculture implies a much greater use of fertilizer. It was then that the eyes of all those familiar with Florida's surprising richness in this particular were turned toward that state, and despite many handicaps due to the war and the consequent short-

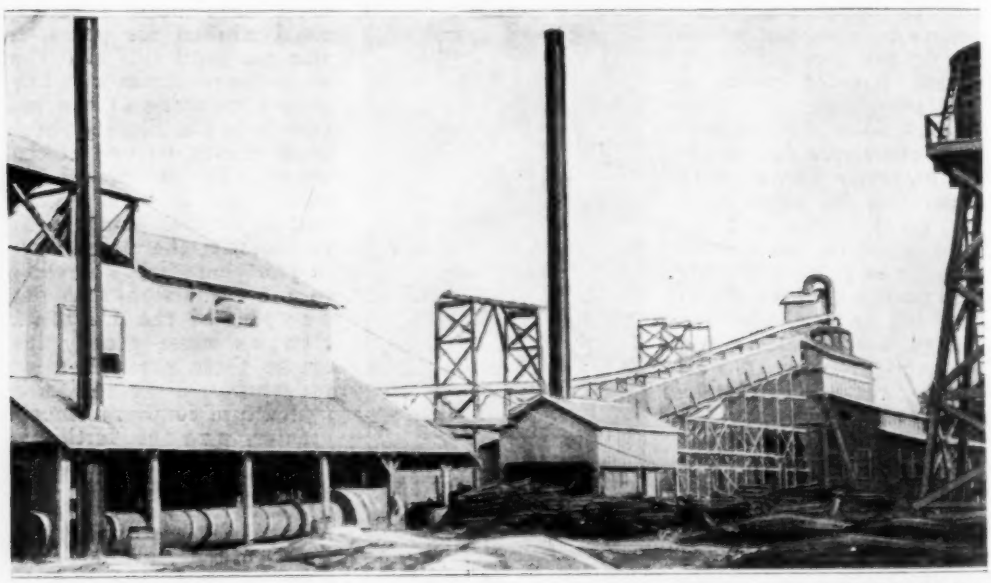
age of ships and railroad cars, congestion of freight and scarcity of labor, Florida phosphate miners did their bit to help

Hard-Rock Phosphate Pits Containing Water are Worked with Floating Dipper Dredges. The Dipper Dumps Its Load into a Steel Mine Car, and It is Then Carried on Rails to the Washing Plant, Located on the Bank above the Dredge

out and relieve the embarrassing situation. In the vicinity of Tampa are the greatest and richest beds of phosphate ever found. To keep our farmers supplied with badly needed fertilizer, the war quickly gave Tampa the distinction, which she is likely to hold indefinitely, of being the largest shipper of phosphate rock in the world. The facilities at its port were developed until they are now the finest in existence for the loading of this product, and the port has the distinction of having the world's fastest phosphate-loading elevator. It is possible for large vessels to arrive, take their full cargo, and depart in the same day.

With present facilities, Tampa can ship, through its port alone, something over 1,000,000 tons of phosphate a year. In normal times most of the rock is carried to the markets of the world by boat; and a number of boats were engaged regularly in this traffic. When the war broke out, the government commandeered some of these craft, but when the importance of the phosphate industry was pointed out, the boats were allowed to continue in the trade.

We had not been in the world's conflict long before it was discovered that Germany had control of some of the best of the phosphate mines in the vicinity of Tampa. The custodian of alien-enemy property was, however, quickly on the job and the mines owned by the Germans



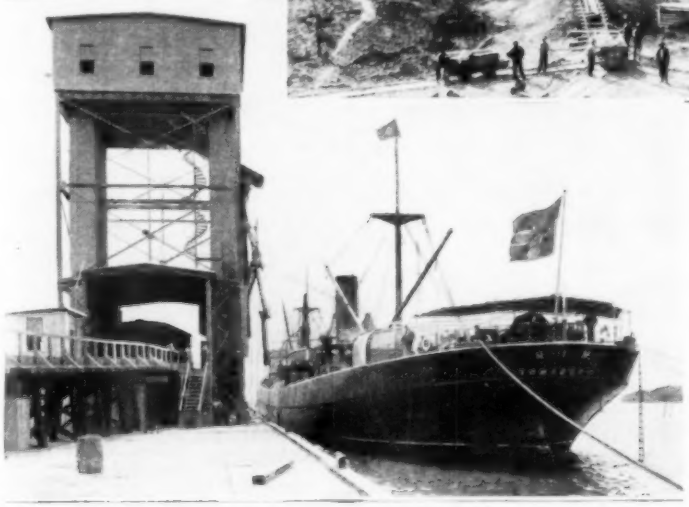
PHOTOS BY GILLIAMS SERVICE

The Soft Phosphate is Dried in a Rotary-Kiln Plant, and Then Goes to Crushers and Pulverizers in the Room above the Kilns. The Pulverized Product is Discharged through the Pipe by Air Pressure, and Finally Carried in Cars up the Covered Trestle to the Sacking and Storage House

were promptly taken over by the United States, and the danger of their destruction immediately averted.

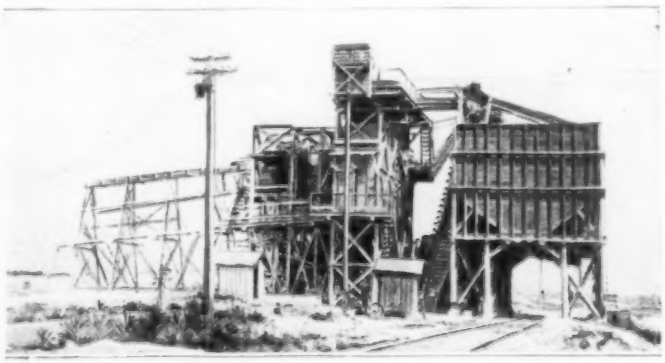
The war quickly made evident not only the immense importance of our Florida phosphate mines for the production of fertilizer for intensive agriculture, but also the inestimable value of the products of these mines for military purposes. Everyone knows the importance of phosphorus in the making of explosives and war munitions. A charge of phosphate rock, coke, and sand, upon being heated in an electric furnace yields about 86 per cent of crude phosphorus. This is purified by filtration through porous tile, chamois skin, or canvas, the operation being carried on under lukewarm water, which keeps the phosphorus liquid. It is usually marketed in the form of sticks, which are made by conducting the phosphorus from the melting pot through a pipe surrounded by cold water. It solidifies in the pipe and can be removed as a continuous rod. Red phosphorus, employed extensively in the manufacture of matches, is made by heating white phosphorus in iron pots provided with air-tight lids.

Phosphate Plant Consisting of Crusher, Washer, and Storage Bin, to Which the Rock is Conveyed in Little Cars That Run up the Inclined Track



The Fastest Phosphate-Loading Elevator in the World Is a Part of Tampa's Dock Equipment, and Makes It Possible for Large Vessels to Dock in the Morning, Take Their Cargo, and Leave the Same Day

But this is not the whole story of the importance of the Florida phosphate mines, as there are various valuable medicinal preparations of phosphorus. Owing to its remarkable influence on the growth of bone in young animals, it has been used in the treatment

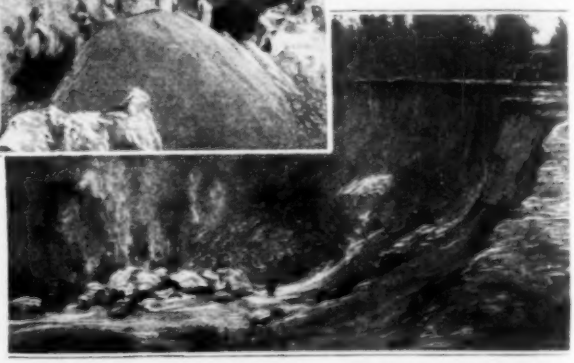


This Picture Shows a Washing Plant for the Pebble Form of Phosphate: The Hopper Construction of the Storage Bin, Which Is at the Right, Enables It to Deliver the Treated Phosphate Directly into Cars Pulled In on the Track Beneath

of rickets and other bone affections in children and adults. It is most effective as a nerve tonic, and is also used as a remedy for skin diseases. The hypophosphites have been recommended for pulmonary troubles, and the glycero-phosphates are useful to stimulate metabolism. Dilute phosphoric acid is used as a gastric stimulant.

A Worked-Out Pit, Whose "Skeleton" Consists of Limestone Cones, from Between Which the Soft Phosphate has been Removed

Simplest Method of Mining Soft Phosphate: Digging by Hand after Stripping the Surface with Horse Scrapers



Typical Soft-Phosphate Pit, Partially Worked: Nodules of Hard or Rock Phosphate Commonly Occur in These Deposits, and Some of Them are Seen at the Bottom of the Pit, Mixed with Lumps of Flint. The Soft Material is Shoveled into Buckets on a Derrick Boom

Bronze manufacturers have long been aware that their product is greatly improved in quality and strength when fluxed with phosphorus. The alloys prepared in this way, known as phosphor bronzes, may contain only about one per cent of phosphorus in the ingot, which may be reduced to a mere trace after casting, but the phosphorus nevertheless enhances their value for use in making implements which require a hard, strong metal.

One of the most important constituents of the material used in distress signals at sea is phosphorus, in the form of calcium phosphide. As various phosphorous compounds make a very dense smoke,

Hydraulic Mining Is the Process Employed to Recover Pebble Phosphate from the Pits, the Product being Picked Up by Electric Pumps and Forced through 10-Inch Pipes to the Washing Plant

this fact was utilized in a most curious way during the war, when clouds of phosphorous smoke were constantly employed to conceal vessels in danger of submarine attack.

Acid phosphate, for years one of our most popular soft drinks, could not be manufactured or served at the soda counter, if it were not for the output of the Florida mines.

The methods of phosphate mining in Florida are entirely different from all other mining operations, and very varied and interesting. There are several natural varieties of phosphate, known principally as hard rock, soft, and pebble. They are all frequently found in close conjunction, but require different mining and handling.

Literally speaking, the phosphate mines are open pits, dug down for many feet below the surface of the earth. Almost all the work in the mines is done by negro labor. In some cases phosphate rock, as it is loosened by the laborers in the pits, is shoveled into buckets attached on a derrick boom, by which means they are lifted with their contents to the surface. As a rule, a pick and shovel are the tools used by the miners; but in other instances, the surface is first stripped with horse scrapers, and then the miners dig the phosphate carefully out by hand from between limestone cones.

What is known as pebble phosphate is mined principally by hydraulic power. This pebble phosphate is raised from the pits by electrically-driven pumps and forced through 10-in. pipes to washers on the surface.

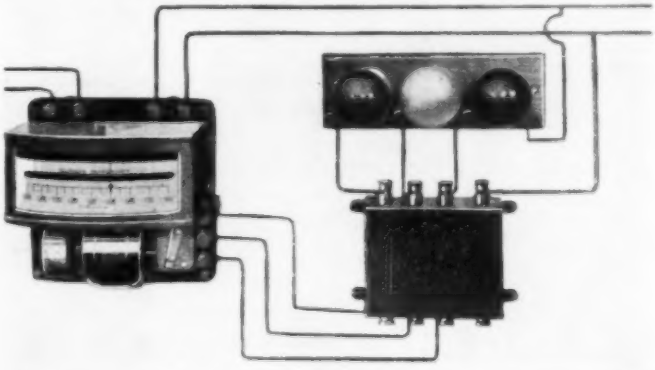
When the soft phosphate is brought to the surface it is conveyed to a rotary kiln, where it is dried. It is then taken to crushers and pulverizers, in a house above the kiln. When pulverized, the product is conveyed by air through pipes, and by cars in covered trestles to the storage and sacking house, after which it is ready for shipment.

Hard-rock phosphate is dried in sheds especially constructed for the purpose. The rock is then piled on wood, which is set on fire. After this process has been completed, the phosphate is ready for pulverizing and sacking.

In some cases, the hard-rock phosphate mines are flooded and the pits are worked by floating dipper dredges, which lift the dripping rock in huge scoops to small mine cars, in which, by means of cables, the product is conveyed along trestled railroads to the plants above, where the phosphate is dried and prepared for shipment.

PYROMETER FLASHES SIGNALS WHEN TEMPERATURE VARIES

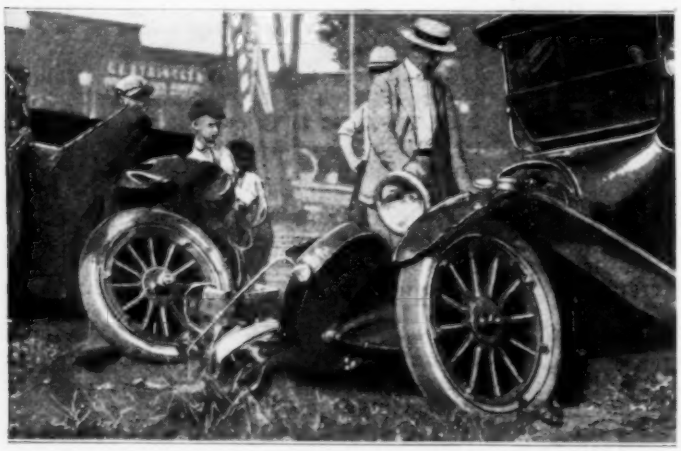
It is not often that scientific measuring instruments class as labor-saving machines, but a new pyrometer marketed by a Philadelphia concern is distinctly in that category. The pointer of the instrument, automatically depressed at one-minute intervals, makes contacts that operate a three-way relay. This causes a white light to glow at the furnace room so long as the temperature is correct within 10°; a red light if it goes too high, and a green light if it falls below normal. The operator usually employed to watch the scale and flash signals with a hand switch, thus becomes superfluous. In a pyrometer equipped with a motor or clock-driven switch, a number of thermocouples can be caused to operate separate signals. Automatic temperature control may also be arranged, or a system that will send proper signals during the course of an intentional progressive increase in temperature.



The Pointer of the Pyrometer Scale at the Left, Making Contact Once a Minute, Operates the Three-Way Relay at the Right and Causes One of the Three Lamps to Glow, Its Color Indicating Right or Wrong Temperature

AUTOMOBILES SIDE BY SIDE HIT LOCOMOTIVE

Because of their frequency, grade-crossing accidents are seldom of general interest; but a recent mishap at Grand Rapids, Mich., was a bit unusual. Like many another it happened in the wee small hours; but unlike any other on record it involved two locomotives and two automobiles. The cars were racing homeward, side by side, from a high-school dance. Too late the drivers saw the oncoming double-header. The first locomotive roared passed them, but together they crashed into the second. Both machines were dragged many feet. The youthful automobilists suffered nothing worse than a bad fright.



This Grade-Crossing Smash-Up Was Unusual in Involving Two Automobiles. Racing Side by Side down a Darkened Street They Crashed at the Same Instant into a Freight Engine. No One Was Hurt although Both Cars were Dragged Many Feet

FAME OF TEXAS BAT ROOST SPREADS ABROAD

The municipal bat roost and the ordinance prohibiting the destruction of the little animals were introduced in San Antonio, Tex., by a local doctor several years ago. The city has since enjoyed such gratifying immunity from mosquitoes and malaria that the doctor's fame has gone abroad. He has now been invited by the Italian government to establish a "battery" in that country, and by the British to experiment with his idea in India. The insufferable heat and prolonged rains of the latter country often make the mosquito nuisance a serious menace to national health.

ELECTRICITY HEATS WATER IN NEW BOILER

Electricity is used for converting water into steam in a new type of boiler recently developed by European experimenters. It is intended especially for use in locations where current generated by water power is available, but where coal is difficult to obtain. Narrow tubes of insulating material, vertically placed, are connected with the boiler and filled with water. High-voltage currents are sent through these tubes by means of electrodes at each end, and the resistance of the water creates an intense heat that quickly produces steam. Water entering the lower ends of the tubes leaves the upper ends in the form of steam. By moving the electrodes the strength of the current is regulated. Tests have shown the boiler to be extremely efficient.

MOTORCYCLIST STANDS ERECT ON SADDLE OF MACHINE

A motorcycle becomes as "skittish" as an unbroken colt when driven on a slippery stretch of ocean beach. But there is a western motorcyclist who is so much a part of his machine that he turns the trick while standing erect on the saddle. During a recent gathering of motor-

The Wet Sand Gives the Motorcycle a Tendency to Slide Out from Under the Rider Which He must Counteract by Constant Shifting of His Body

Fitted with Legs, as Above, the Dark Chamber Becomes a Complete Developing Table; Its Ruby-Glass Door is Seen in the Top. In the Center the Case is Closed for Traveling

The Portable Dark Room as It is Used by the Photographer

Opened and Set Up for Use, as Above, the Dark Room is Large Enough for Any Ordinary Photographic Work; Note the Elastic Cuffs for the Hands, and the Eye Piece

cyclists he toured up and down the water's edge in this way at a speed of 25 miles an hour. His machine skidded several times, but a quick shifting of his weight always saved him from a fall.

CUBAN GENERAL'S MEMORY HONORED BY MONUMENT

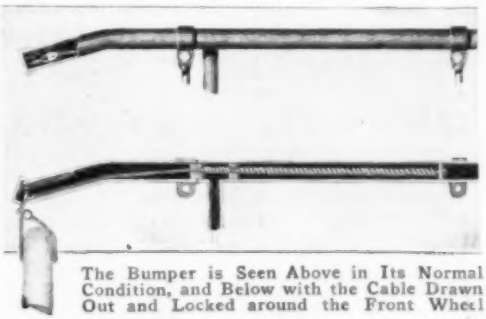
Cuba is to pay honor to the memory of General Maximo Gomez, the island republic's military hero, by erecting a costly monument. A first prize of $25,000 was awarded recently to Aldo Gamba, an Italian sculptor, for a model of the memorial, which is to cost $200,000. Second and third prizes went respectively to Huertas Cabarrocas, a Spanish-Cuban, and Gutson Borglum, an American. General Gomez became popular as the leader of the Cuban forces in the war for independence from Spain, from 1895 to 1898. He also took a prominent part in the Ten Years' war, a revolt which began in 1868. On the day of his death, June 18, 1905, the general's family was presented with a gift of $100,000 by the government of Cuba. At the conclusion of the Spanish-American war, General Gomez was honored at a public reception given by the American forces occupying Havana at that time.

COMPLETE PHOTO DARK ROOM PACKS LIKE SUITCASE

The dark room, necessary evil, has always been the one rigid obstacle to the perfect flexibility of the photographic art. Now, however, the operator can carry a complete dark chamber along with him, and develop his exposures when and where he pleases. The "room" packs in a case less than two feet long, about a foot wide, and four inches thick. It opens to a height, in the larger size, of 18 in. in front and 13 in. in back, with walls of light-proof fabric. Elastic cuffs at the sides admit the operator's hands, while he looks through a hood in front, equipped with two shutters that are opened by pressure on the hood, and instantly close on release. Trays and plates are inserted through a ruby-glassed door in the top.

AUTOMOBILE LOCK AND ALARM INSIDE TUBULAR BUMPER

The tubular bumper on the front of an automobile is used by a Minnesota inventor as container for a steel cable,



The Bumper is Seen Above in Its Normal Condition, and Below with the Cable Drawn Out and Locked around the Front Wheel

with a padlock on the end, which may be pulled out and snapped around the front wheel when the car is parked. If any attempt then is made to move it or to pull on the cable, a lug inside the bumper is drawn against a spring contact, and an alarm bell in the car rings loudly. A retractile spring restores the cable to its case when it is released, and a cap, held by a spring, returns to its place covering the end of the bumper. The wiring is concealed in a tube.

ADJUSTABLE FIXTURE JOINT WILL NOT BREAK WIRES

An objectionable feature of adjustable electric-light fixtures has been their tendency to wear out wires at the points of adjustment. In a new fixture about to be placed on the market, the inventor declares he has overcome this objection by the use of extra-long, open knuckle joints, which allow slackness in the wire at such points, thus preventing chafing because of tightness, or breakage because of sharp-angle bends. Locknuts tighten the joints. One fixture in which these joints are used has an upright holding two lights on adjustable arms.

The Open Knuckle Joints of This Adjustable Electric-Light Fixture will Not Chafe or Break the Wires Running through Them

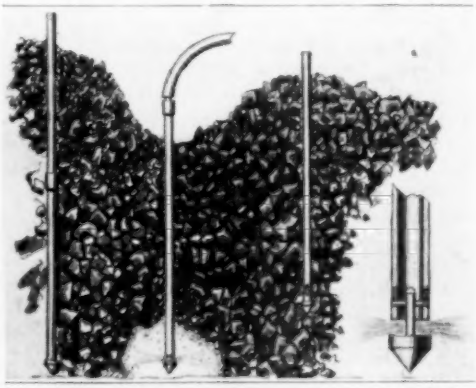
LARGE GAS-REVERSING VALVE EASILY OPERATED BY HAND

In metal-working furnaces, the flow of fuel gas must be periodically reversed. With a type of valve recently placed on the market this can be easily done by hand; a 36-in. valve, for instance, being reversed in from 3 to 7½ seconds with a pressure not exceeding 25 lb. The base of the valve is a rectangular iron pan containing water, and with three ports in the bottom, the center one connected to the chimney and the others to the furnace. The whole is covered with an iron case, with a door at each end and a gas intake at the top. Inside is a semielliptical hood, which covers two of the ports, and is swung on counterbalanced levers to connect the center port with either of the others. The edge of the hood hangs in the water, which makes an effective seal. A hand lever operates the valve through a wire rope.

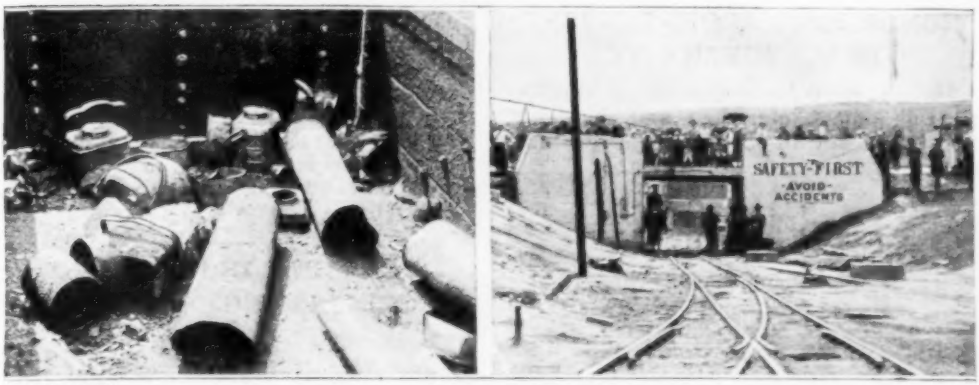
The Phantom View Above of the Reversing Valve Shows How the Counterbalanced Hood Inside Swings to Cover Two of the Three Ports; in the Right-Hand Picture, the Reversing Gear is Seen Operated with Its Crank and Wire Rope

FIRE-FIGHTING DEVICE GOES TO SEAT OF COMBUSTION

A fire-extinguishing device has been produced which is particularly adapted to dealing with spontaneous combustion, as in coal piles and other places where the source of the fire cannot be reached by the ordinary apparatus. It consists of a single pipe, or conduit, or of a plurality of such pipes connected together. The lowermost section of the device is a conical driving member, which also serves as the nozzle for the ejecting of water. This cone-shaped member is easily driven into a coal pile, and it closes and protects the end of the pipe during the driving operation. Within the lower end of the pipe are opposite longitudinal slots, into which extend the ends of a cross pin carried by the stem of the driving member, the inner end of this stem being so made as to deflect water into the slots.



For Fighting Fires in Coal Piles, the Long Pipe Nozzle may be Driven to the Bottom of the Pile, the End being Protected as Seen in the Section at the Right



PHOTOS BY JENNINGS

The Charred Interior of One Little Mine Car is Shown at the Left, Cluttered with Empty Powder Cans, Dinner Pails, and Miners' Caps, Mute Evidences of Disaster. This Picture was Taken a Few Minutes After the Death Train was Hauled from the Mine. The Tunnel Entrance may be Seen Dimly beneath the Bridge in the Right-Hand Photograph

SCORES BURNED TO DEATH IN MINE TUNNEL

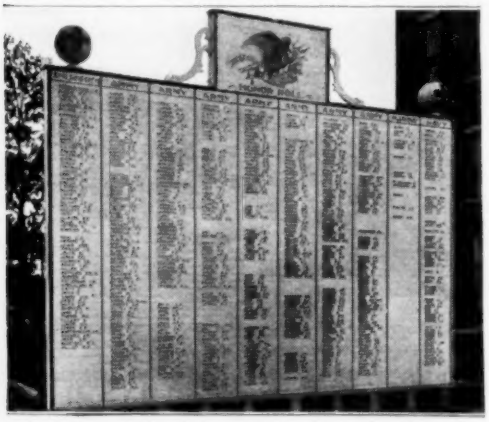
A mine disaster of peculiar horror recently cost nearly a hundred lives in Wilkes-Barre, Pa. Workers near the mouth saw 14 mine cars enter the tunnel, drawn by an electric motor. The little cars were packed with men and boys on their way to work in a distant drift. In the two central cars had been placed seven kegs of black powder, weighing about 300 pounds. A moment later those above ground were horrified by mysterious shrieks of agony. They entered the tunnel to find dead and dying piled in unrecognizable heaps along the track and in the cars. Survivors told them that the steel powder kegs had in some way short-circuited the overhead trolley wire, igniting the powder, which flared and grew to a mass of roaring flame. The draft from the ventilating system had sucked the flame in upon the helpless miners; which explains why those outside were first advised of disaster by the cries of the dying within, trapped by the narrow passage.

PHOTO BY JENNINGS

The Curious Crowd is Shown before the Mouth of the Mine in Which Four Score were Killed by an Explosion. In the Background, to the Left of the Loaded Cars, Is the Death Train. The Cause of the Disaster is Disputed, Some Claiming a Short Circuit between the Overhead Trolley Wire and the Steel Powder Kegs in the Cars

HONOR ROLL ADORNS STREET IN SOUTHERN CITY

Honor rolls have become a familiar sight in offices, churches, and municipal buildings; but in Griffin, Ga., the local

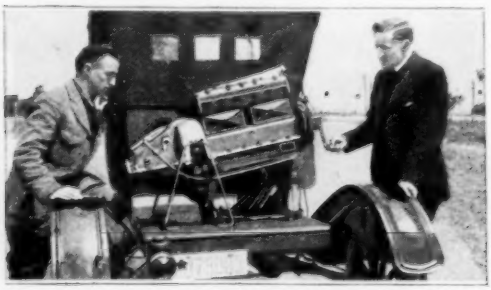


The Red Cross Society of Griffin, Georgia, Chose the Center of a Principal Street as the Location for Their Tribute to Local Service Men

Red Cross society has placed a huge "roll" on one of the principal streets. It stands in the green parking, 15 ft. high, with the symbol of the Red Cross on two large electric bulbs. Gold stars appear against many of the 1,800 names, reminding the townspeople each day of their privilege to prove that the dead have not died in vain. The names appear on both sides of the roll, those of white soldiers on one side, those of colored soldiers on the other.

AUTO CARRIES SECOND ENGINE TO SHOW OILING SYSTEM

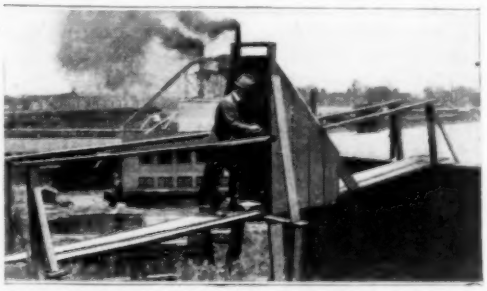
A Los Angeles salesman is driving around in a car that has an engine at both ends. The one in the rear, however, is there solely to demonstrate the virtues of a new lubricating attachment. Instead of using gasoline, it is turned over with a geared crank, and the prospective customer observes the oiling action through glass panels in the motor base. The demonstrating engine is mounted at an angle equivalent to a 10-per-cent grade, to show that all cylinders receive oil equally in that position.



Hand-Driven Engine on Automobile's Rear Deck, for Demonstrating a Device That Lubricates All Cylinders Uniformly on Grades

DOORS ON GANGWAYS STOP TRESPASSING ON ROOFS

Considerable trouble was experienced by a western railroad in preventing trespassing on the roofs of the company's oil tanks, reservoirs, and buildings, reached by gangways, until a scheme for closing this means of entrance was put into practical use. Doors provided with padlocks were placed in frames built on the gangways, and, as further discouragement for would-be explorers of the railroad property, guards were placed on the sides of the door frames, thus making it impossible for anyone to pass the obstructions by crawling around them.

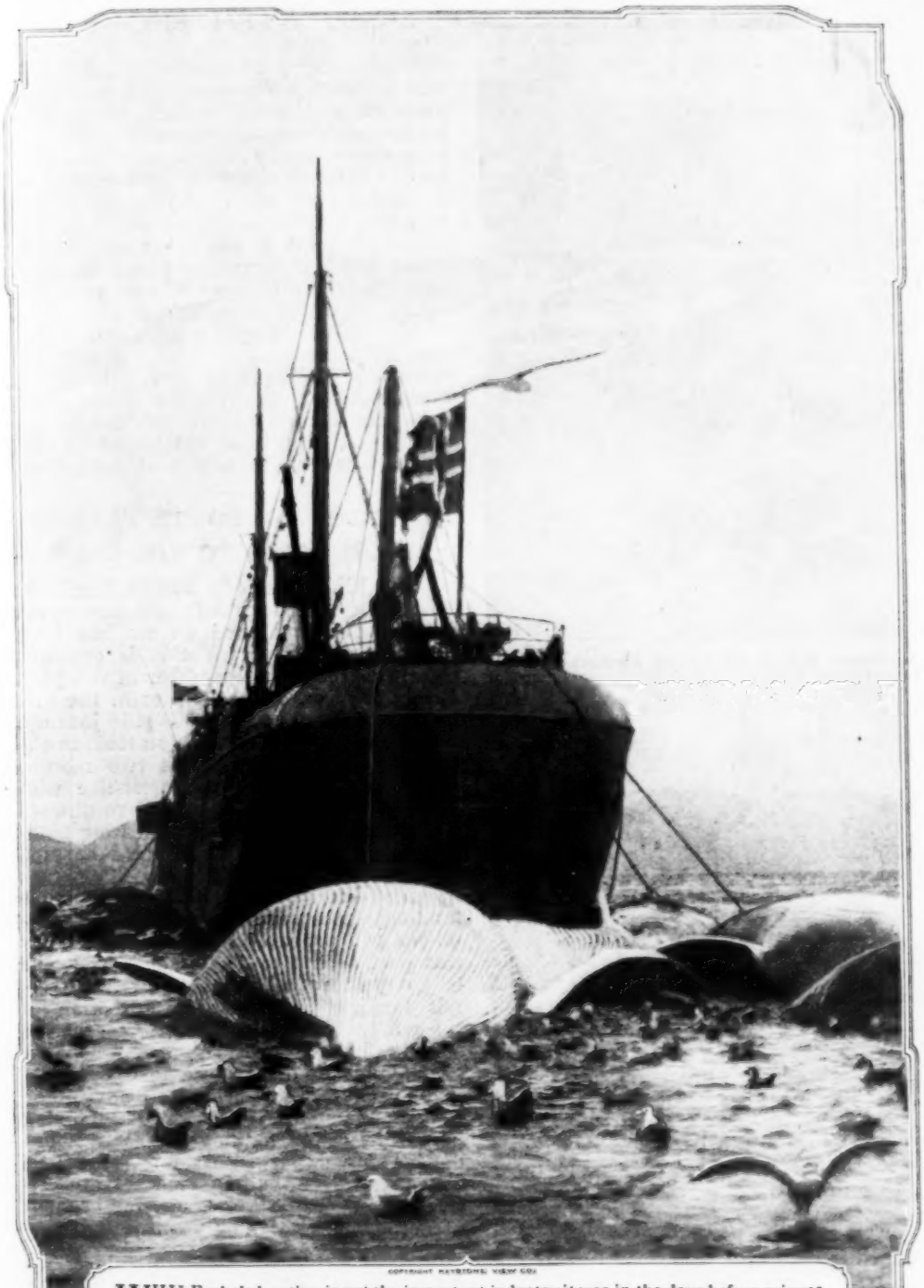


These Locked Doors, with Their Guards, Effectively Bar Trespassers from the Roofs of Railroad Property in a Western City

CITY FREIGHT TUNNEL TAPPED FOR THEATER VENTILATION

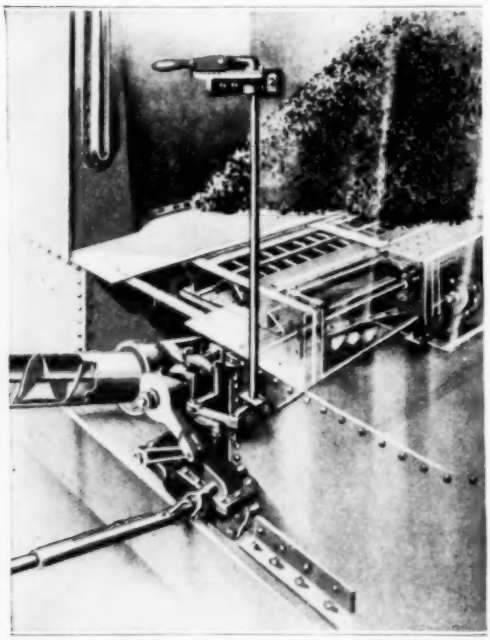
A number of Chicago theaters are playing to midwinter crowds this summer as a result of a revolutionary change in their ventilating systems. The old air intakes above the roofs were dismantled. Shafts were sunk to the cool freight tunnels which burrow their way from outlying coal and freight yards to the subterranean vaults of skyscrapers and department stores. Here was found cold air in abundance, needing only a little filtering to remove the dust of underground traffic. It is believed, too, that this air is far more germfree and healthful than that drawn, as formerly, from above the smoky city.

EXPLOSIVE HARPOONS USED TO CAPTURE WHALES

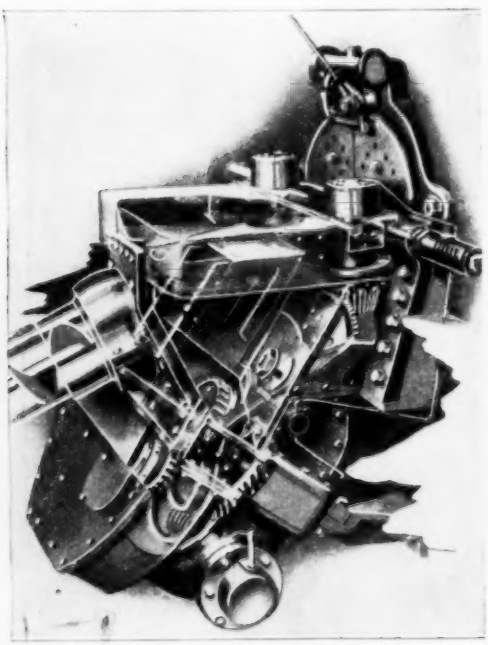


WHILE whale hunting is not the important industry it was in the days before science found substitutes for sperm oil and whalebone, it has not been discontinued entirely. The picture shows a whaling ship, from which crews go in quest of the aquatic mammals, anchored near the Spitzbergen Archipelago in the Arctic Ocean. Torpedo harpoons, which explode after piercing the skin of a whale, are used by the hunters. Tied to the ship are the bodies of several sulphur-bottom whales captured in this manner.

STOKING MACHINE FEEDS COAL WITH SHOVELS



The Tender End of the Stoking Machine, Showing the Apertured Feed Plate and the Screw Pump for Conveying the Coal to the Engine: The Speed is Controlled by the Lever Above



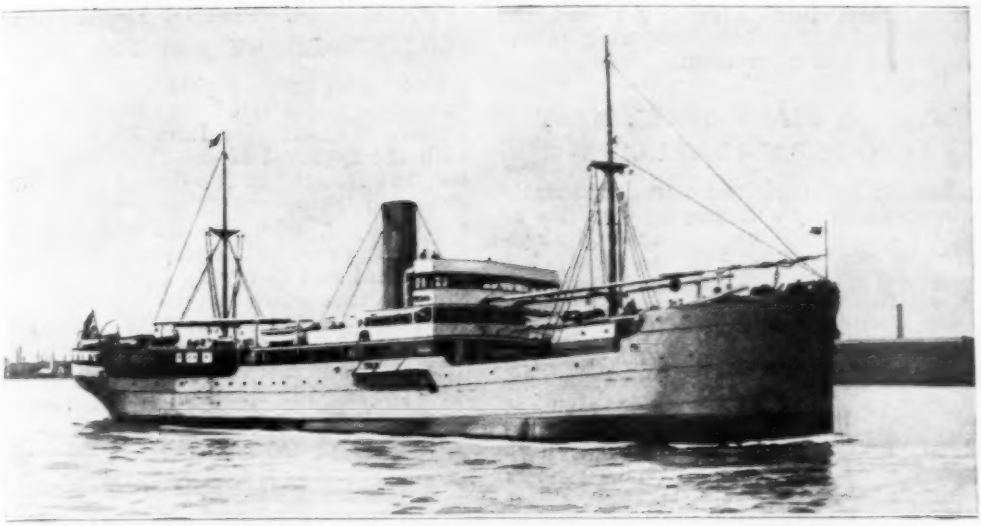
The Stoker Shovels Swing from the Box at the Top to the Fire Box at the Right, Propelled by the Gears Below; the Slanting Chute Carries the Coal Elevator

A locomotive on one of the big railway systems is equipped with a peculiar form of mechanical stoker, whose performance during several months' trial has been exceptionally satisfactory. The coal, shaken through apertures in a feed plate, is carried from the tender to the engine by a screw conveyor, fitted with a flexible telescopic joint at the coupling. At the boiler head is a reciprocating elevator, which lifts the charges of coal to a box whose front end opens into the fire door, occupying the lower 5½ in. of the opening. In the rear corners of this box two shovels are pivoted to swing through a quarter-circle. By the use of a cam drive, these shovels are swung alternately forward, with a motion calculated to distribute the coal to the best advantage.

AFRICAN AIR ROUTE TRACED FROM CAIRO TO THE CAPE

In all his dreams of a British Empire in Africa it is doubtful whether Cecil Rhodes ever imagined an air line from Cairo to the Cape. Yet it is expected that in October or November of this year, barely 17 years since his death, the first airplane will make the 5,000-mile journey. Three survey parties were started on the preliminary work less than two months after the signing of the armistice with Turkey. The first worked southward along the Nile from Cairo, locating landing places in plenty as far as Khartum. Thence to the lake country their task became increasingly difficult, possible landing places becoming so few that seaplanes will probably have to be used for this part of the route. Luckily the Nile is everywhere sufficiently wide to permit landing, whatever the direction of the wind. The second party experienced similar difficulty in the swamps, elephant grass, and jungles of the lake country; and are likewise expected to advise the use of seaplanes. The third surveying party discovered landing places in abundance on the last 2,000 miles to Cape Town, however, finding many South African towns eager for the establishment of aerodromes in their vicinity.

¶Applicants for enlistment in the air service will be carried in airplanes from their homes to the nearest aviation field on notifying the proper commanding officer of their intention.

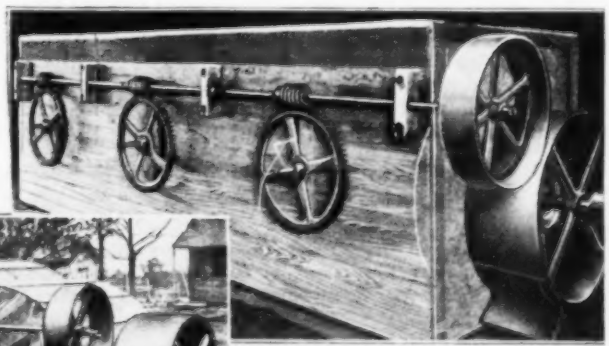


FIRST STEAMSHIP COMPLETELY FABRICATED BY CHINESE SHIPBUILDERS

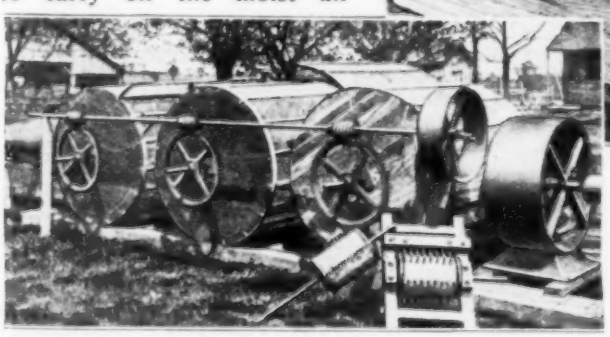
CHINA marks another step forward in industry with the completion of the steamship "Mylie." This vessel, of 3,150 tons dead weight, is the first to be completely constructed, engine and all, in a Chinese shipyard by Chinese shipbuilders. The engineering and shipbuilding works responsible for it is located in Shanghai. The head of the concern has two sons studying in the United States, one at Dayton, Ohio, and the other at Notre Dame, Indiana.

BY-PRODUCT OF CIDER MILLS ADDS VALUE TO APPLES

Every year the diet of cattle grows less monotonous. Now, thanks to a recently developed process, they are feeding upon apple pomace. Despite its appetizing sound, this is not a pastry; it is the waste pulp from cider mills. Attempts to prepare this material by steam driers proved only partly successful. The highly satisfactory dehydration method now used operates at a temperature not exceeding 150°, utilizing a blower to carry off the moist air from rotary drying drums. Attached to the center shaft of each drum is a spiked pulley-shaped picker which shreds the pomace to hasten the drying. One bushel of apples ordinarily yields four gallons of cider. From this pomace then is made, by a patented process, one quart of sirup, worth 25 cents. Now, after dehydration, the residue or cattle ration, weighs about five pounds, and



Dehydrating Apparatus for Preparing Cattle Fodder from Apple Pomace: Each Gear Turns a Drum, and the Blower is Seen Just below the Pulley

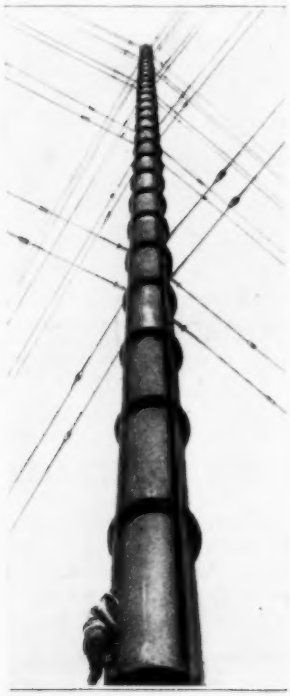


The Dehydrating Mill Dismounted to Show the Drying Drums: In the Foreground Are Two of the Cylindrical Pickers That are Carried by the Drums

brings three to four cents a pound, the by-product value thus comparing favorably with the cider itself.

CLIMBS GIANT STEEL MAST TO REPAIR WIRELESS

Steeple jacks of iron nerve frequently win applause by shinning up flagpoles or scaling sky-scrapers; but the best of them were outdone recently by a volunteer repair man at the Chelmsford, England, wireless station. That plant's antenna tower is a sheer steel mast, 450 ft. high and perhaps 5 ft. in diameter, whose only footholds are the iron bolts in its flanges. When a storm destroyed the top aerial, the 55-year-old wireman scaled the bolts and replaced it. The long, hazardous ascent of the trembling tube took the venturesome climber nearly an hour, but he made it without mishap.

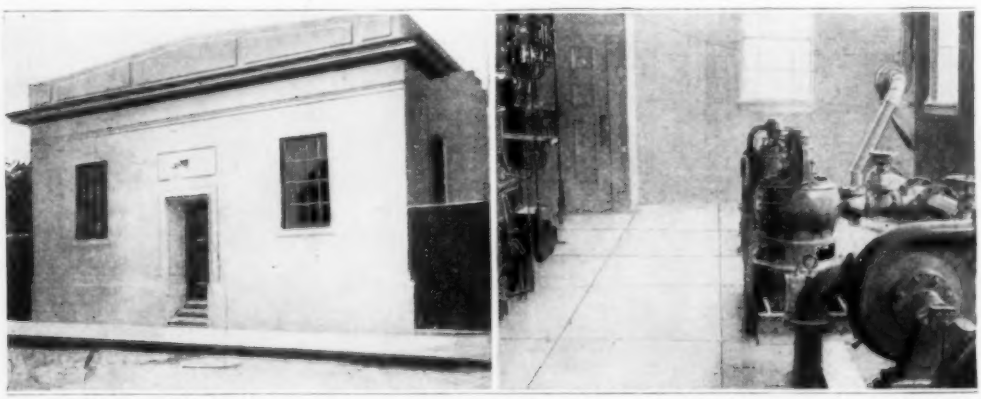


PIONEER AIRPLANE HOSPITAL SUCCEEDED BY LARGER TYPE

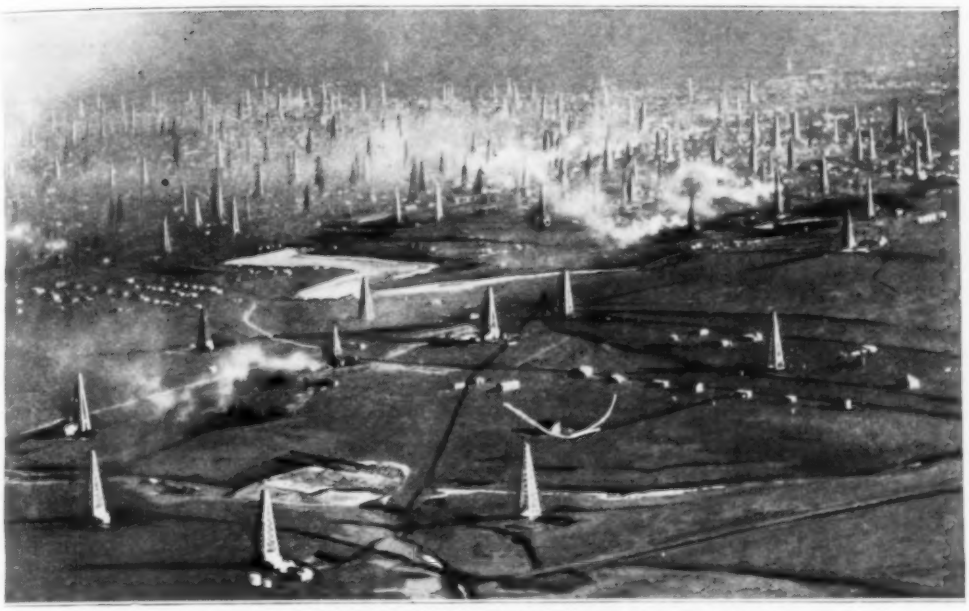
Successful trial flights of the aerial "hospital," illustrated in Popular Mechanics Magazine for June, 1919, coupled with the approval of the French war office, has resulted in the design of a more elaborate machine. The new type is much larger, with space for a surgical staff of five, and complete operating equipment and X-ray apparatus. It also carries a tent which may be kept at a constant temperature by the heat of the motors. The big fuselage can accommodate four stretcher cases and four sitting, besides the attendant and pilot.

AUTOMATICALLY CONTROLLED SEWAGE-PUMPING STATION

In a section of San Francisco where the sewers are below the level of the bay, a pumping station has been installed to raise the sewage high enough for gravity disposal. The pumps, housed in a concrete structure of dignified design, are electrically driven, and an automatic control board is provided, which practically takes the place of a human attendant. Besides the usual starting and stopping arrangement for automatic maintenance of level, an ingenious alarm system, operated by a relay, gives instant notice at the corporation yard if a pump, for any cause, fails to operate properly. One of the pumps handles without trouble the sticks, rags, and miscellaneous refuse commonly found in sewage, and a specially designed strainer, with a hoisting arrangement for cleaning, separates this material. A blower disposes of odors through a 75-ft. stack.



The Concrete Sewage-Pumping Station, as Seen at the Left, Has Quite a Dignified Exterior; Inside Is the Automatic Pumping Equipment Observed at the Right, the Electrical Controls being Located on the Left Wall

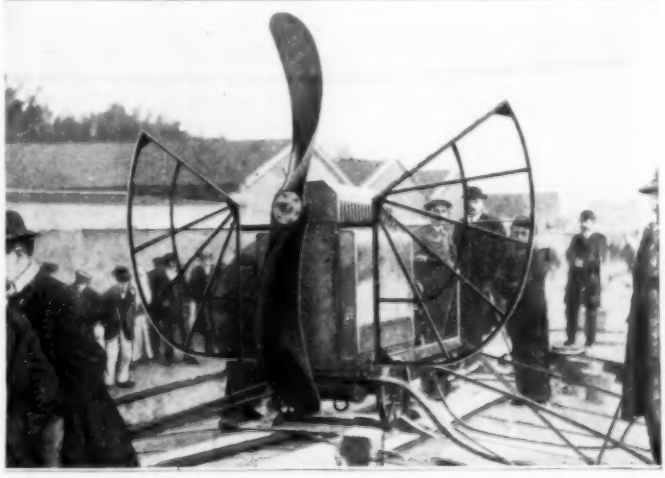


OIL WELLS OUTNUMBER HOUSES IN TEXAS VILLAGES

THE romantic call of the oil fields has in the past lured thousands to new-found pools in California, Wyoming, Kansas, and Oklahoma. The latest stampede has been to north-central and western Texas, where sleepy, sun-baked villages have become centers of activity and excitement. The airplane photograph shows a typical town, now studded with oil wells in back and front yards, overlaid with dirt and soot, and crowded with adventuring oilmen. Fortunes are made, and lost, overnight. One company risked $5,000 for leases which were later valued at $1,000,000. Whatever its effect on individuals, the discovery of this new field assures to America a domination of the world's oil trade.

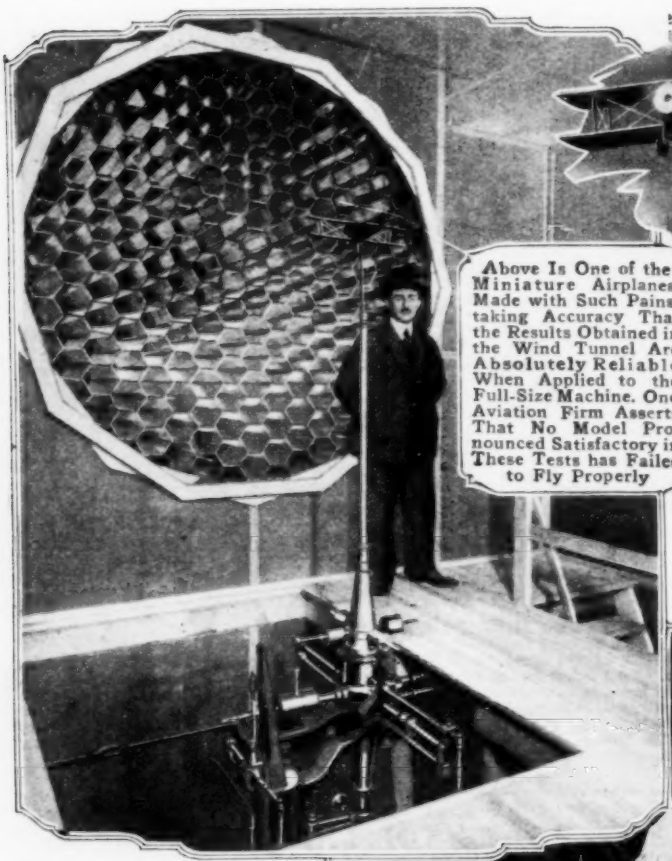
AIR PROPELLERS FOR BOATS ON TRIAL IN FRANCE

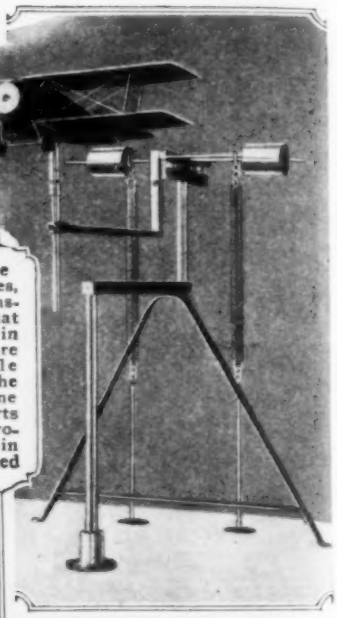
The use of air propellers for driving commercial water craft is being seriously studied in France. In the trials, made on rivers and canals, a barge 25 ft. long attained a speed of nearly 10 miles an hour with an engine of only 3 hp., and was able to tow eight small boats with 40 passengers. A 20-hp. automobile engine fitted with an airplane propeller drove a 120-ft. barge three miles an hour. Engines of 15 to 17 hp., with various types of propeller, ran an 11-ton tug 6½ miles an hour, and a 32-ft. raft with 12 passengers 7½ miles. The purpose of the experiments is to prove adaptability of the method to the weedy and sand-choked streams of France's African colonies, where navigation with underwater propellers is difficult to maintain.



One of the Airplane-Propeller and Engine Units Used for Driving Various Water Craft in French Experiments: The Equipment is Made Portable So That It may be Transferred to Different Boats on Trial

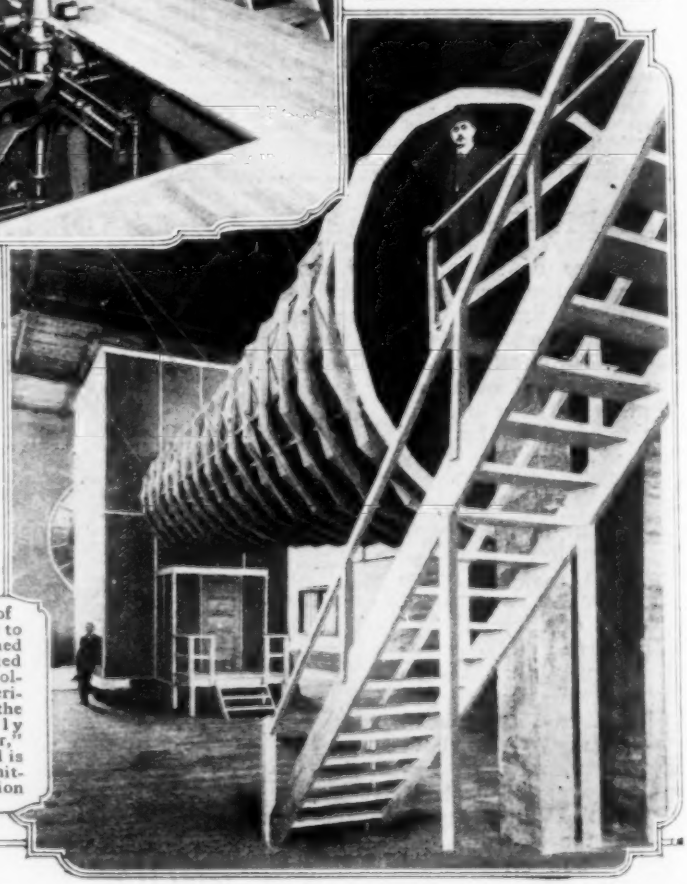
AMERICA HAS BIGGEST AND BEST WIND TUNNEL





Above Is One of the Miniature Airplanes, Made with Such Painstaking Accuracy That the Results Obtained in the Wind Tunnel Are Absolutely Reliable When Applied to the Full-Size Machine. One Aviation Firm Asserts That No Model Pronounced Satisfactory in These Tests has Failed to Fly Properly

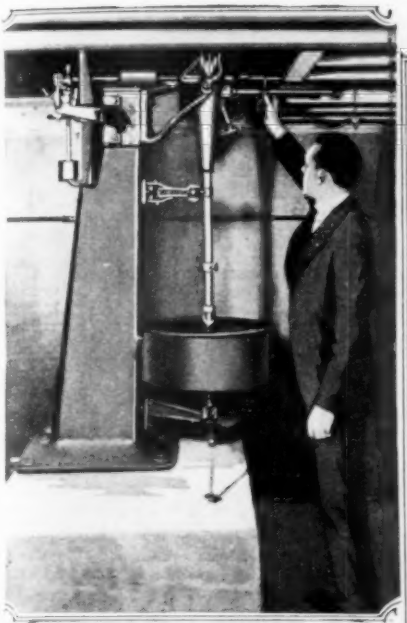
This Is the Second Floor of the Experimental Chamber Shown in the Lower Photograph. Sucked through the Honeycomb Screen, the Air Streams into the Chamber as a Smooth-Flowing Cylinder, Seven Feet in Diameter. It Encounters the Experimental Model, Producing Effects Which are Measured by the Delicate Aerodynamic Balance



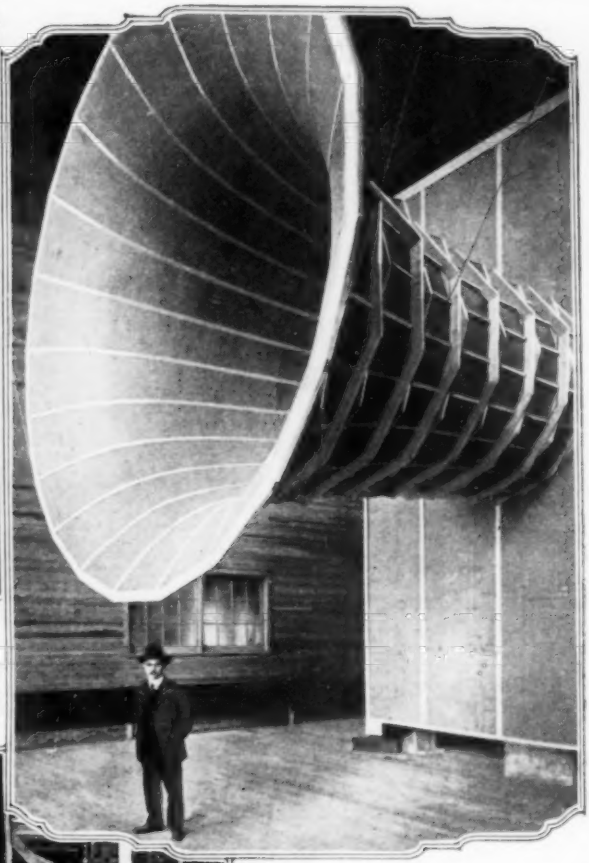
This Tunnel for Wind Tests of Miniature Airplanes is Believed to Be the Largest and Best Designed in the World. Air is Sucked through the Horn-Shaped "Collector," Seen beyond the Experimental Chamber, through the Chamber Itself, and Finally through the Tunnel, or "Diffuser," in the Foreground. The Tunnel is Suspended by Steel Wires, Permitting Unhampered Air Circulation

PHOTOS COPYRIGHT,

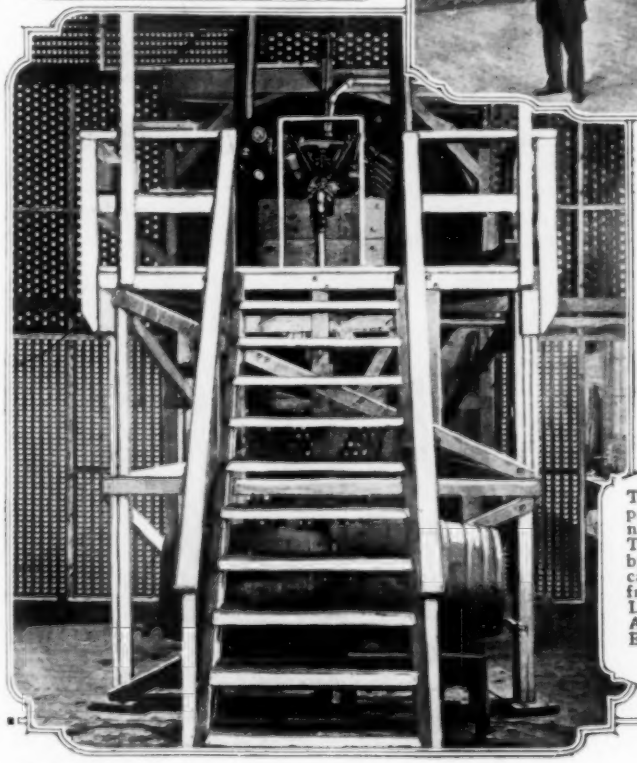
FOR TESTS OF MODEL AIRPLANES AND AIRSHIPS



The Aerodynamic Balance is Mounted on a Stone Base on the First Floor of the Experimental Chamber. The Connection between the Model and the Balance is Shown in the Upper Left-Hand Corner of the Opposite Page



Above is Shown the Horn-Shaped "Collector," Which Guides the Wind against the Model in the Experimental Chamber. At the Outer Rim the Collector Measures 17 Feet Across; at the Wall of the Chamber, 10 Feet Less. The Cross Section Is a 20-Sided Polygon, Constructed by Placing Together Two 10-Sided Polygons and Rotating One Past the Other



The Staging Supports a 400-Horsepower Motor, Which is Directly Connected with a Three-Blade Propeller. The Speed of the Motor is Controlled by the Operator in the Chamber, Who can Thus Speed Up the Air Current from 40 to 100 Miles an Hour. The Last Figure Represents the Maximum Air Speed Yet Obtained, but It is Expected That the Figure will Shortly be Exceeded

KEYSTONE PHOTO NEWS

STREET OILING SPEEDED BY TWO-TIP SPRAYER

Fast and efficient work is done by a two-tip oil sprayer used on the streets of Oakland, Calif. Fastened on the end of the feed pipe, which is swung from the rear of the oil wagon, each tip has a regulating valve, opened and closed by a rod extending to a position convenient for the operator of the sprayer. The flow may be regulated from a fine spray to a solid stream. The oil is heated before it is applied to the street.

More Surface is Covered in Less Time by This Two-Tip Oil Sprayer Used by the Street Department of a Western City

LARGEST TANK SHIP AFLOAT HANDLES OIL RAPIDLY

A mammoth oil-tank ship, recently delivered to a transportation company, is said to be the largest of its kind afloat. The vessel has a dead weight of 18,000 tons, is 530 ft. long, and has a beam measurement of 68 ft. 5 in. Five boilers, with a working pressure of 220 lb. per square inch, supply steam to the compound turbines that operate the propelling machinery of the ship. Oil is used as fuel. On the vessel a system of pipes, four and one-half miles long, makes it possible to load or discharge separately four different grades of oil at one time.

¶ Resin resulting from the combination of certain naphthols may be used instead of shellac for polishing or insulating, according to a European scientific journal. When the resin is dissolved in benzol or toluol, and ligroin added, it is possible to remove the coloring of the resin, and leave a colorless material suitable for varnish.

LITTLE FIRE TRUCK REDUCES AIRPLANE RISK

If there's any one thing that tends to fill the airman with gloomy foreboding, like the ambulance which haunts the large flying fields, it surely must be the chemical fire apparatus which bobs about one training center. No flier will deny its value, however, in combating fire which constantly menaces his airplane in the hangar and in the air. The little machine carries, in addition to the usual complement of extinguishers and axes, a chemical tank, holding 120 gal. at a pressure of 150 lb., said to be enough to tear the fabric from a burning wing. The chassis is of special construction, too, being shortened and with an added swing to the front wheels to enable it to turn quickly or twist through a crowded field.

Little can be Done for an Airplane in Flames a Mile above the Earth. If It Is near, or on, the Ground, However, This Little Chemical Apparatus will Save It, Unless the Flames have Gained Too Great a Headway

RULES FOR TRANS-PACIFIC AIR CONTEST ANNOUNCED

Additional rules to govern his trans-Pacific airplane contest have been announced by the motion-picture producer who offers $50,000 to the winner. The contest will be open from September, 1919, to February, 1920, and to licensed airmen of all nationalities. The flight must be completed within 12 days, and may be made in either direction. If flying westward the airman must start from Venice, Calif., and land on the mainland of Australia, on the Japanese Islands, or on the continent of Asia. If made in the opposite direction, the flight must end on the mainland of the United States.

COMBINE SPEED AND SAFETY IN ELECTRIC SHEARS

Electrically driven shears, designed to be safe as well as fast, are among the latest devices on the market. The upper blade of the shears is actuated by an electric motor having a speed of 9,000 r.p.m., while the lower blade is stationary. Connection between the motor and blade

While These Shears Cut with Great Speed, the Slight Oscillation of the Moving Blade and the Dull Ends of Both Blades Make Them Safe

is by a link. As there is an oscillation of only 1/16 in. of the moving blade, there is small chance for injury to the operator of the shears.

FLOWER-LADEN SHIP SUNK AS TRIBUTE TO DEAD

As part of memorial services for unknown sailors who died at sea in the great war and other conflicts, a battleship of the monitor type, covered with flowers, was sunk a short distance off shore by patriotic organizations of an eastern coast city. When the ship went down the blooms remained floating on the surface of the water, a tribute to the men of the navy whose bodies were buried at sea. More than 1,000 sailors took part in the ceremonies.

MANY VALUABLE JEWELS COVER LODGE EMBLEM

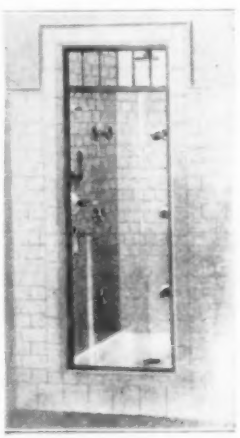
Designed by an Indiana jeweler on the occasion of a lodge convention in his city, a gorgeous secret-order emblem con-

Set in This Bejeweled Lodge Emblem Are 914 Diamonds and 12 Rubies. The Large Stone in the Center Weighs 5.02 Karats

tains 926 jewels, and is valued at $50,000. A large diamond set in the center of the piece, which represents a double eagle carrying a sword, weighs 5.02 karats, while two set in the wings weigh four karats each. Twelve rubies are set in the sword, and diamonds cover the remainder of the emblem. The stones are set in a composition-metal mounting.

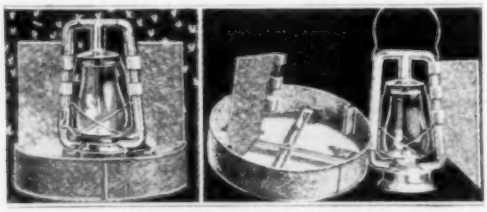
MODERN BATHROOM ADJUNCT IS LUXURIOUS SHOWER STALL

Since the shower bath is no longer a clubhouse specialty, architects are making provisions for it even in the less pretentious homes and apartments. An arrangement which adds luxury to convenience consists of a stall opening from the bathroom, with a plate-glass door and tile walls. Three sets of shower sprays, with valves and fittings of nickel and porcelain, offer a variety of effects and an inviting appearance, without adding greatly to the cost of installation.



LANTERN ATTRACTS MOTHS TO DEATH IN TRAP

Destroying moths by taking advantage of their natural weakness for flying about bright lights is accomplished by a patented trap recently placed on the market. Its essential parts are a shallow galvanized-iron pan, an ordinary tubular-frame lantern, and two metal wings for attaching to the sides of the lantern frame. The trap is set at night by lighting the lantern and placing it in the pan, in which it is supported at a little distance above the bottom by cross braces. The wings are then attached and the pan partially filled with kerosene and water. Moths flying around the lantern strike the wings and fall into the mixture in the pan, which kills them.



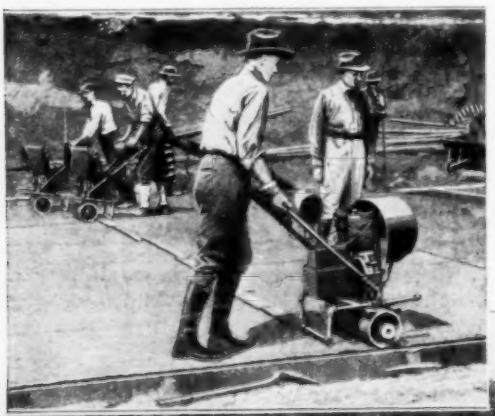
Moths Lured to This Trap by Light, Blunder against the Wings on the Lantern Frame and Fall into the Pan of Kerosene and Water Below

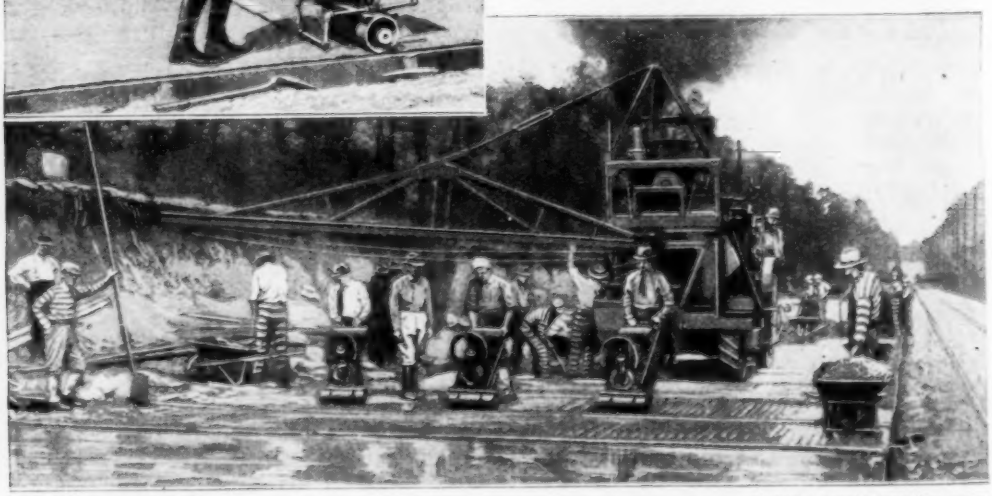
CHINA EGG TRAPS SNAKE IN CHICKEN HOUSE

Swallowing a china nest egg was the fatal mistake which brought to a close the long egg-stealing career of a black snake. Found in a henhouse which it had been plundering, the reptile was vainly trying to squeeze through the hole by which it had entered the building. The lump formed in the scaly body by the nest egg would not permit the exit, and the snake was killed. A post-mortem operation was performed to remove the egg.

UNBALANCED ENGINES USED TO TAMP CONCRETE ROAD

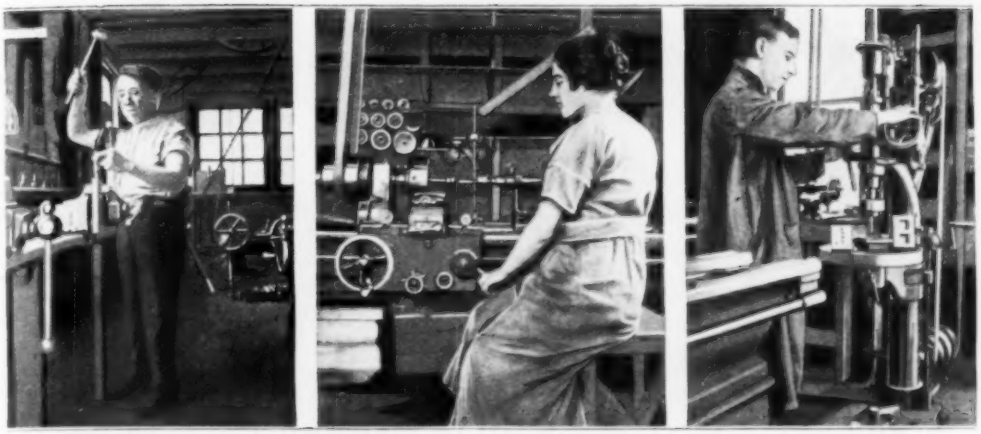
Ordinarily a two-cylinder engine running out of balance would be regarded as the least useful of mechanisms. Such an arrangement, however, is put to peculiarly effective use in road-making operations around Atlanta, Ga. An unbalanced motorcycle motor is mounted on an iron frame with a heavy roller at the bottom. Boards are laid upon newly poured concrete, and when the frame is pushed along over them, the pounding vibrations of the engine tamp the concrete rapidly and uniformly, saving much manual labor.





COPYRIGHT, PRESS ILLUSTRATING SERVICE

One of the Unbalanced-Engine Tamping Machines is Seen in Operation in the Close-Up View at the Top, and the Large Picture Shows How the Machines are Used in Battery for Building Concrete Roads



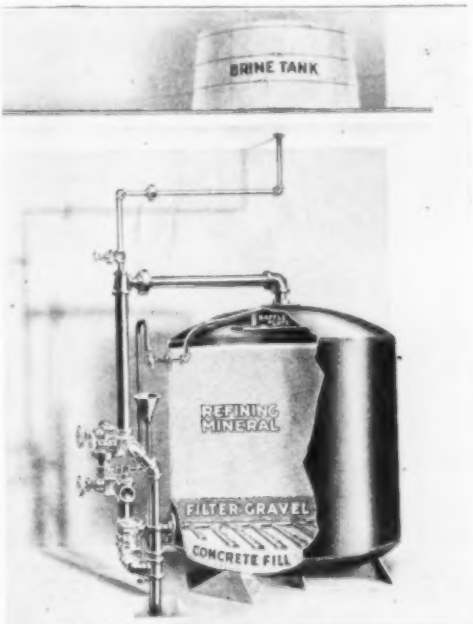
The Workman at the Left is Cutting Square and Hexagon Holes with a Drift, in the Old Way, While in the Center and at the Right the New Drill and Chuck are Seen in Operation in Lathe and Drill Press

CHUCK AND DRILLS FOR HOLES SQUARE OR HEXAGONAL

Recent improvements in tools for drilling square and hexagonal holes have so simplified the process that such equipment is now available to the most modest of shops. A special drill with five cutting edges is used for hexagonal holes, and one with three edges for square holes. The drill is held in a floating chuck, with a standard shank for use in lathe or drill press. A steel guide, with a hole the size and shape desired, is fastened to the work, the drill following the edges of the hole. The outfit is particularly useful for making socket wrenches and similar work, drilling rapidly and accurately.

SOFTEN HARD WATER BY AID OF MINERAL PRODUCT

Hard water, as is generally known, is water which holds in solution a quantity of sulphate and other salts of lime, taken up during its contact with earth and stone. It is objectionable on many counts. A simple but effective process of softening it has been evolved from the discovery that a sodium-bearing mineral, found in South Dakota and belonging to the zeolite group, will absorb lime in exchange for its sodium. In practice the method is applied by flowing the hard water down through a steel tank filled with the porous mineral in granular form, resting on a layer of filter gravel. At the bottom is a concrete lining and a network of collecting pipes for the softened water. When the sodium content becomes exhausted, in time, the flow of water is simply reversed, and then a brine solution is directed upward through the mineral until the sodium has been restored and the lime washed away. The equipment is then ready to resume its duties.



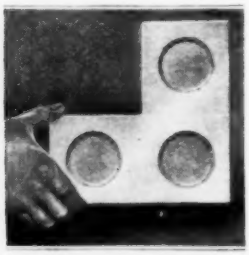
Partial Section of a Water-Softening Installation, Showing the Course of the Water through the Bed of Mineral, and the Brine Tank for Restoring Its Properties

¶ While landing at Albany, N. Y., to complete a flight from Dallas, Tex., a government bombing plane recently killed two children, injured another, and wrecked itself in a clump of trees.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine

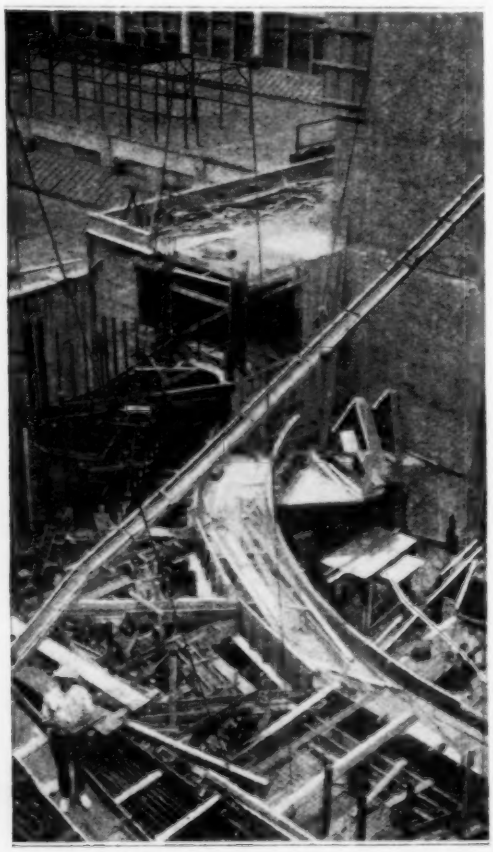
STRONGER WALLS POSSIBLE WITH IMPROVED BRICK

More substantial walls may be constructed with a new type of brick, patented not so long ago by a retired contractor of the Southwest, and known as self-bonding and interlocking, the inventor states. On one side of each brick are two circular, bevel-edged bosses, while on the reverse side, in the same relative positions, are two depressions, into which the bosses fit exactly. The brick is recommended for domes or arches, chimneys, and hollow walls.



GOVERNMENT-BUILT VESSELS SOLD BY SHIPPING BOARD

Ships constructed by the government to counterbalance submarine sinkings during the war are being sold by the Shipping Board to private operators. At a recent sale, seven American concerns purchased 19 steel vessels having an aggregate dead-weight tonnage of 128,472. A total of $27,821,120 was paid for the ships, which ranged in weight from 5,350 to 9,600 tons each. Prices paid per ton were from $210 to $225. Six ships were bought by one company, four by another, and two each by four concerns. One buyer took a single ship. All of the vessels will fly the flag of the United States. The Shipping Board has disposed of 332,045 dead-weight tons of ships for a total of $51,856,620 since the armistice was signed.

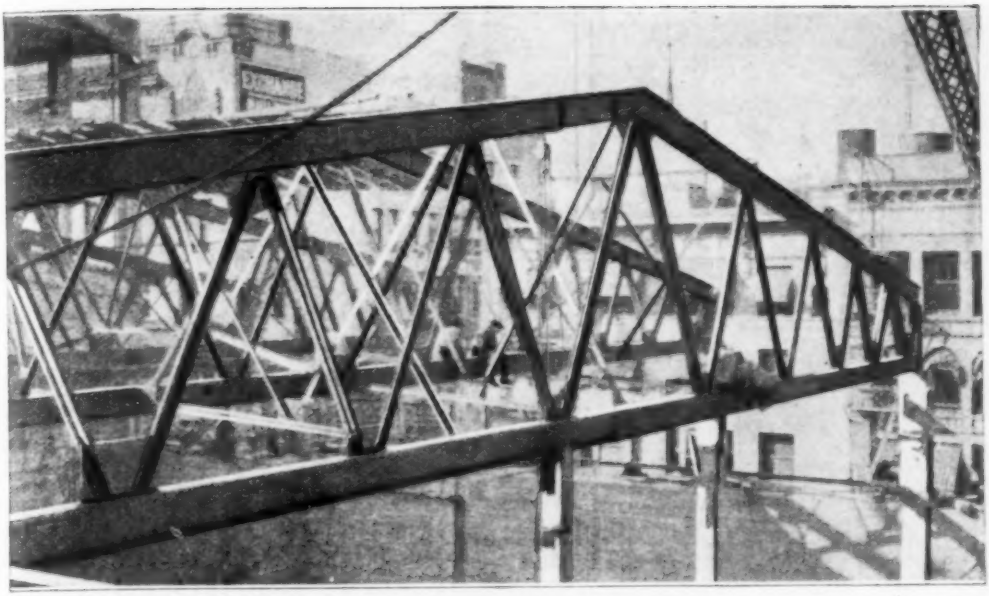


This Picture Shows One of the Concrete Chutes Used to Fill a Mammoth Arch Form in Constructing a Los Angeles Theater Building

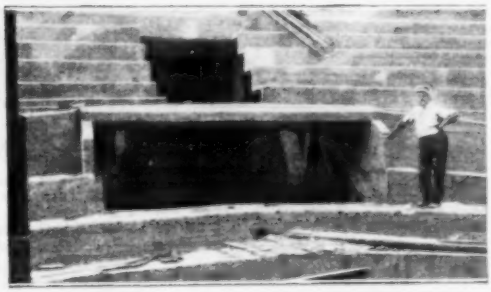
MAMMOTH CONCRETE ARCH IN COSTLY THEATER

Notable not only as one of the most beautiful and expensive structures of its kind in this country, but as one in which for the first time a concrete arch, such as is used in bridge construction, supports the balcony of a theater, a 12-story office and theater building recently was completed in Los Angeles, Calif., at a cost of $1,000,000. There are no posts in the theater because of the arch, for which concrete was used when it was found impossible to obtain steel. The weight of the span is 9,000,000 lb. It is 12 ft. wide and 110 ft. long, and contains 180 steel rods. In pouring concrete into the forms for the arch, chutes made of steel concrete floor forms, overlapping in clapboard fashion, were used. This form of chute is said to be original with the Los Angeles builders. Extremely elaborate are the decorations of the theater, both interior and exterior. Carved wood is conspicuous in the interior decoration scheme. Another feature is the projection room, in which are placed the moving-picture machines and spotlights. This is built of concrete, and placed so as not to obstruct the view of any person sitting back of it. Steel and asbestos doors to this room lessen the fire danger. Steel was used in the construction of the office building.

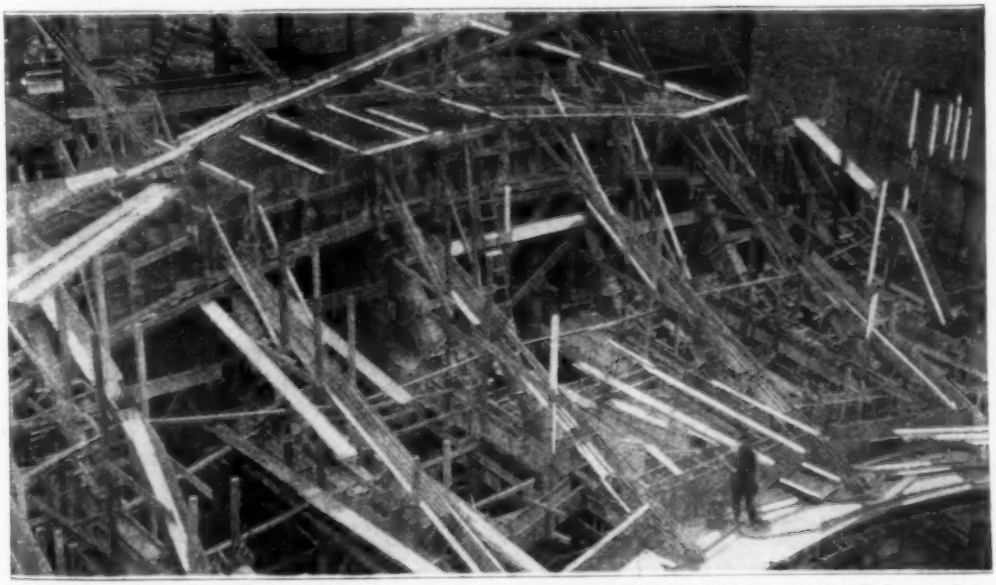
One of the features of the theater is a great jeweled dome, so placed in the ceiling as to appear to be suspended in



How the Roof of the Million-Dollar Theater was Erected: The Lower Girder of This Steel Roof Member Is 108 Feet Long. Cut in Half, It was Laid on Three Half-Inch Steel Cables, Strung between Concrete Pillars, and Then Joined into a Solid Piece. Afterwards the Upper Parts of the Support were Fastened on Top of the Girder, Making a Construction Strong Enough to Hold the Roof



To the Left Is Shown the Fireproof Projecting Room, Built in the Concrete Arch Which Forms the Theater Balcony. Steel and Asbestos Doors Protect the Audience from Fires or Explosions in This Room. It is Placed So That It does Not Obstruct the View of Those Sitting behind It. The Room is Ventilated by a Flue, Which Also Serves to Carry Away the Fumes Which Result from Heating the Film in the Projecting Machine



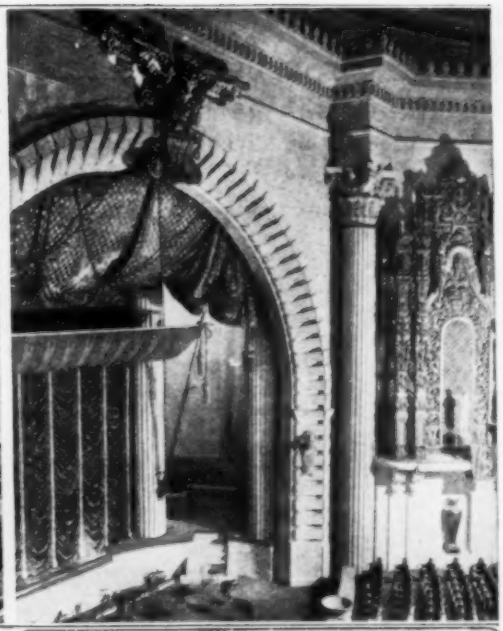
Form into Which 1,620,000 Pounds of Concrete was Poured to Make the Self-Supporting Balcony of the Los Angeles Theater: An Idea of the Amount of Steel Used for Reinforcing the Great Arch can be Obtained by Studying the Interior of the Form. Completed, the Balcony Weighed 9,000,000 Pounds. So Far As is Known, This Is The First Use of a Reinforced-Concrete Arch of Such Size in Building Construction

Interior of Los Angeles' Million-Dollar Theater as Seen from the Stage: There Are No Pillars under the Balcony to Obstruct the View of Persons Seated on the Main Floor. In the Center of the Picture may be Seen the Projecting Room. Visible at the Top Is the Gorgeous Jeweled Dome, Which Appears to Those Sitting under It to be Suspended in the Air

A Look into the Lobby: Probably the Decorations in This Western Playhouse Are More Elaborate Than Anything of the Kind Ever Before Attempted. The Chandelier Shown Here Is of Carved Wood

Cost was Not Considered When It was Decided to Make This Theater a Place of Beauty. The Elaborate Carved-Wood Decorations Seen Here Adorn the Wall over the Doors in the Lobby

One of the Costliest Theater Entrances Ever Built, Photographed in Los Angeles a Few Days Before the New Playhouse was Opened to the Public: The Money Value Is in the Neighborhood of $10,000, and Dozens of Artists and Workman Labored for Two Years to Produce This Result



The Artistic Stage: A Noteworthy Feature of This Beautiful Theater Is the Draped Curtain Which Covers the Moving-Picture Screen. The Housing of the Pipe Organ at the Right Represents an Enormous Amount of Labor and Money

the air. Hidden lights, playing on the dome, produce a gorgeous effect. Due to the careful planning of the architects, the acoustics are nearly perfect.

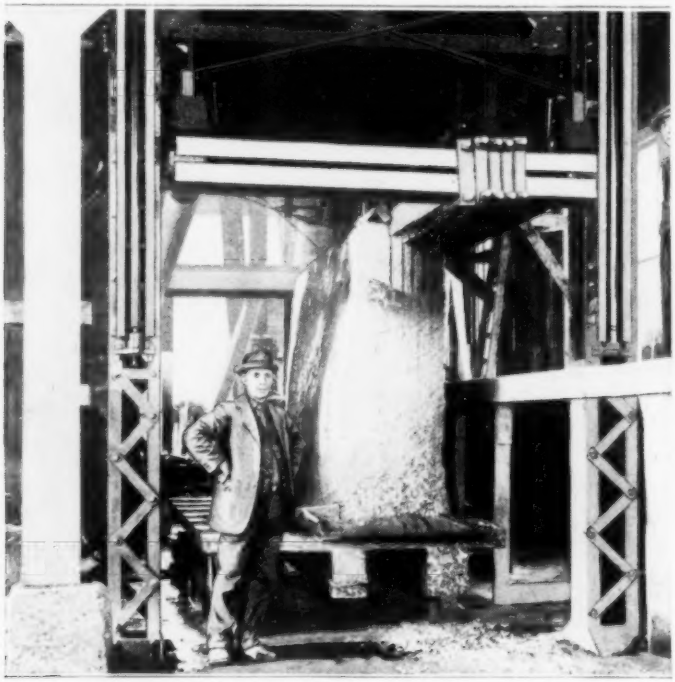
AIR SERVICE ASKS INVENTORS FOR HELP WITH ITS PROBLEMS

The attention of American inventors is called by the Air Service to a number of problems which have long been studied without satisfactory solution. The service is anxious, first, to learn of a gasoline tank which will withstand a volley of fifteen .30-caliber shots fired from 30 yd., tracer, incendiary, service, and armor-piercing bullets being used. Fire must not occur in 10 consecutive tests. A better portable hangar is wanted for field service, also; preferably a large one that will not blow down nor permit water to accumulate in pools. A single engine-driven generator and battery is wanted to furnish power for radio, heating, and lighting; and for the starter, the ignition, and the motor-driven camera. The idea here is to effect a saving in weight, and to do away with the parasitic resistance of the various wind-driven generators now in use. A cranking device, to be mounted on an auto truck for use about an aerodrome, is another invention wanted.

Even in the Halls Leading to the Upper Balconies the Designers of the Theater Spared Nothing to Obtain Unusual and Harmonious Effects. An Example of What was Accomplished is Shown Above

MODERN STONECUTTER SLICES GRANITE LIKE CHEESE

The process of dividing the rough blocks of quarried stone into the smaller slabs of commerce is sometimes called "sawing." The term is descriptive in only a limited sense, however, as the thin-steel cutting blades are smooth and not provided with teeth. In place of teeth, sharp particles of sand or some other abrasive are fed from upper reservoirs to the edges of the moving blades. The process is thus an abrading and not a cutting one as might be expected.



Streams of Sand and Water are Fed to the Smooth Steel Blades as They Move Back and Forth through the Great Block of Stone. The Blades Thus "Rub" Their Way through the Hardest Material the Quarry Yields

MILK DRINKING IN FACTORY BRINGS GOOD RESULTS

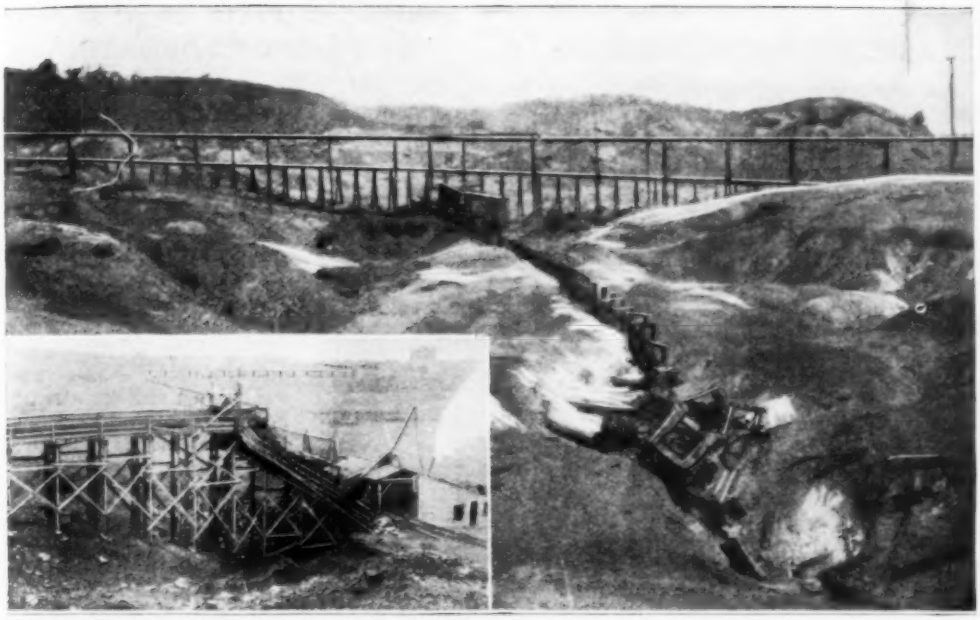
Milk drinking has increased the efficiency and improved the morale of employes in an Illinois factory to such an extent that milk venders are allowed to go through the plant twice daily to sell to the workers, many of whom buy a pint at each visit. Food specialists recommend milk as a refreshing and nourishing liquid food, and efforts are being made to popularize its use.

AMERICA'S PEACE-TIME NAVY NOW IN THREE FLEETS

America's great navy has been divided into three parts. Concentrations of hostile purpose are now over, and the ponderous games of war are to be played only in the spirit of competitive sportsmanship. The encouragement of that spirit was, indeed, a major consideration in the reorganization of the fleets, whose great divisions, naturally, are the Atlantic and Pacific. Practically equal in strength, each of these fleets has four divisions of battleships, two of cruisers, eighteen of destroyers, and two of mine layers; but the Atlantic fleet retains three divisions of submarines, while the Pacific gets two. The third fleet, the Asiatic, is composed of such ships as are needed to preserve American interests in that quarter. In emergency, it is estimated that the two main fleets could be combined, ready for hostilities, within two weeks, while at least once a year they will meet as rivals in endurance and engineering tests, and in the greatest sham-battle engagements ever staged on the high seas.

WASTE COAL-MINE SILT NOW WORKED FOR FUEL

Coal mining brings to the surface a number of materials besides coal. The process of putting the combustible mineral in shape for market separates from it a great quantity of sand, mud, and slate. This silt is either carted away or accumulates about the mines in huge piles of waste. But many a waste pile has been made to pay a profit, and the searching eye of war conservation soon discovered particles of good coal glistening in the hills of silt. At some of the mines in Pennsylvania, breaker plants have been erected whose sole duty is to reduce the acres of dump heaps as fast as carloads of the material can be brought



COPYRIGHT, PRESS ILLUSTRATING SERVICE

A Million Tons of Silt Occupied This Broad Expanse Until Recently, but Now It is being Worked Over for the Fine Coal It Contains. The Small Picture Shows a Silting Plant in Operation, Separating the Earth and Slate from the Coal

to them. Jiggers wash away the earthy part, and what remains, like gold dust in the miner's pan, is a fine coal that finds a ready market in these days of fuel demand. Some of the mine companies have carried the cleaning-up process so far that the children of their employes now romp over playgrounds where million-ton silt deposits formerly rested undisturbed.

BOLSHEVIST PAY-ROLL PLAN FAILS IN THEATER

Of the many queer tales that have come out of chaotic Russia since the overthrow of the czar, perhaps none shows more clearly how unsatisfactory applied bolshevism has proved than the story of the Moscow opera house where the radical principles were put to test. The soviet government appropriated $100,000 for the theater, with the provision that equal salaries be paid to all persons connected with it. A leading tenor protested against receiving the same pay as a stage hand, and declared that he would rather sell programs than sing, if the wages were the same in each case. Not until the bolshevist pay-roll system had been abandoned did the tenor return to the stage, and no attempt has been made since to experiment along that line.

BEET SUGAR BY-PRODUCTS FATTEN BEEF CATTLE

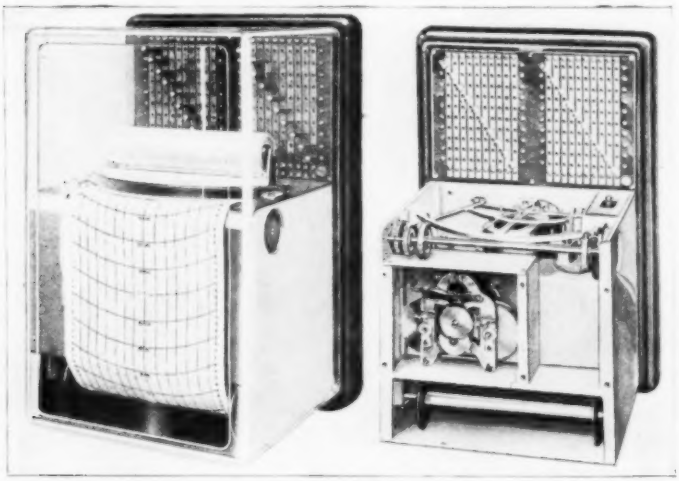
Until it was discovered by California sugar-beet growers that beet tops and pulp are ideal food for beef cattle, these by-products of sugar refineries were allowed to go to waste. Now the growers not only produce beets, but they raise cattle as well. Narrow-gauge railroads run from the sugar plants to the feeding pens, and the tops and pulp are hauled to the animals in dump cars, from

Great Herds of Beef Cattle are Fattened for Market on Sugar-Beet Tops and Pulp, Refinery By-Products, in California. The Provender is Hauled to the Feeding Pens in Dump Cars Running on Narrow-Gauge Railroads

which they are transferred to feeding racks on both sides of the tracks.

RECORDS OF TEN FURNACES KEPT BY ONE PYROMETER

An automatic pyrometer may now be had which records continuously the temperatures of 10 furnaces. Each of the 10 thermocouples is switched on once every 10 minutes for a period of one minute. During this period a stylus prints in red ink three readings on the green chart, these readings serving to indicate whether the temperature in question is rising or falling. At the expiration of this period the chart is slightly advanced, the next thermocouple switched in, and three more readings made. Thus 10 minutes elapse between two consecutive readings on any given furnace. If less than 10 furnaces are employed, however, the interval may be reduced by proper arrangement of the plugs on the switchboard. If only one furnace is plugged in, the readings are continuous with 20-second intervals.



This Multiple Registering Pyrometer will Keep a Continuous Record of the Temperatures in 10 Furnaces. At the Right is Shown the Clockwork Make-and-Break Mechanism, with Needle for Indenting Chart

SEAPORT FOR SWITZERLAND PROPOSED BY ITALIAN

A seaport for Switzerland in the Venice Lagoon, near Chioggia, Italy, has been proposed by the Italian chief inspector of public works. An excellent harbor already exists at the location, and if warehouses, railroads, and docks were built, an outlet to the Adriatic Sea would be provided for the inland republic. It is estimated that all necessary improvements could be completed within a year.

AERIAL TOURISTS TO JOURIIEY IN SQUADRON FORMATION

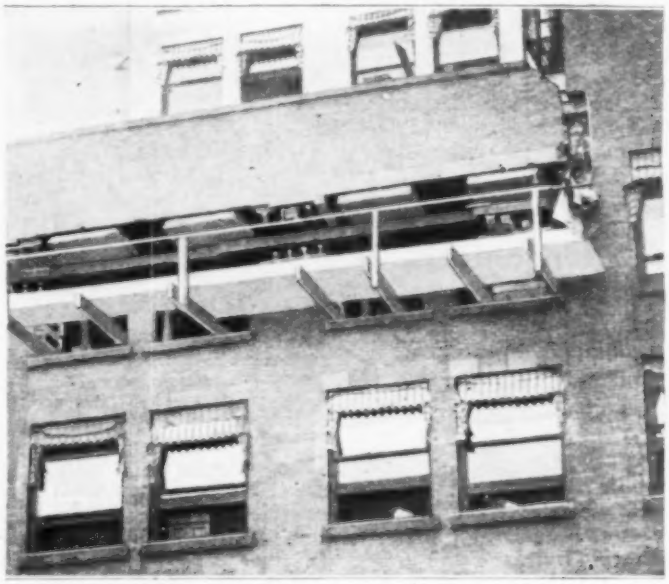
The Aerial League of America will this summer begin its "pioneer airplane tours," which resemble in purpose and plan the famous Glidden automobile tours of the past. The league hopes to interest the general public in this way, and to help the government dispose of surplus military and naval airplanes and equipment. Plans and itineraries have already been completed for four types of tours. The one-day tour will interest airmen who can spare only one day a week. The week-end tour will consume two or three days. The vacation-week tour will last a week, while the last class will include tours lasting 10 days to two weeks. The aerial tourists will travel in squadron formation, each group under a single commander. They will cover an average of only 250 miles each day, affording plenty of time for tennis, golf, or other diversions, at the scheduled stops. Mechanics meanwhile will fill emptied tanks and make necessary repairs.

PORTABLE THERAPEUTIC OVEN IS QUICK CURE FOR ILLS

Mysterious though the term may sound, "thermotherapy" means merely the treatment of human ills by heat; and very efficacious the method has proven for sprains, wounds and rheumatic ailments. A college director of athletics has devised a portable therapeutic oven in compact form, equipped with electric lamps for the heat, and a spray for medicated lotions. The whole oven is set over the affected part and the liniment sprayed by compressed air from a small pump, while the glowing lamps bake out the sufferer's pains.

FLOOR ADDED TO BUILDING WHEN ROOF IS RAISED

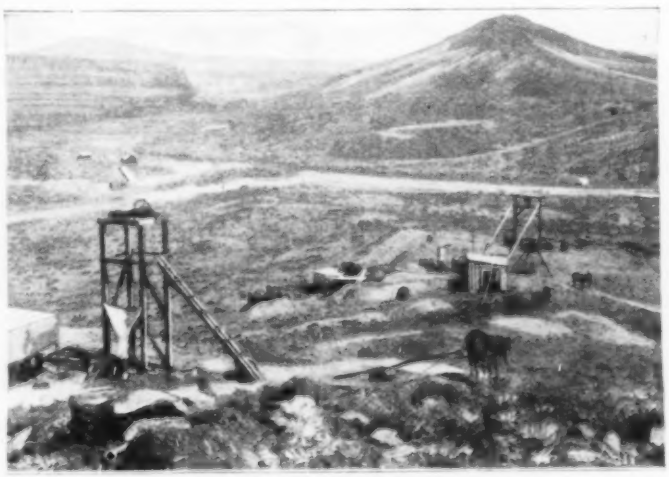
Another floor was added to a 10-story brick building in an Ohio city recently by raising the roof of the structure and inserting material to support it at this greater height. Above the tenth floor of the building, which is 45 ft. wide and 100 ft. long, formerly was a low-ceilinged attic, lighted by small windows. When it was decided to make this attic a regulation floor, the walls were split on a line with the tops of the windows, and all above that was lifted by jacks. Thirty-five of these were used, operated simultaneously by as many men. It required a day and a half to raise the roof 4 ft. As the roof rose, steel building material was put in, inch by inch, and the brick walls were built in soon afterward. Special sliding joints allowed water and steam pipes to extend with the elevation of the upper part of the structure. The tenants of the building were not disturbed by the work, even those on the tenth floor going about their tasks as usual while the jacks were being turned. The new floor is now in use.



A 10-Story was Made an 11-Story Structure by Raising the Roof and Putting in Material to Support It at the Higher Level. Thirty-Five Jacks Did the Work in a Day and a Half

NATURE VENTILATES MINE WITH SINGLE SHAFT

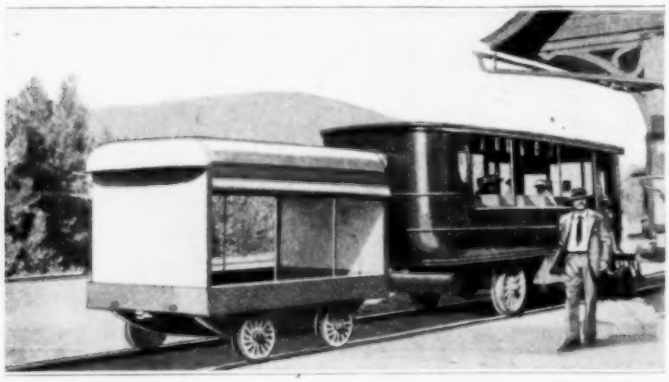
Nature, with only a little guidance by man, ventilates a small Nevada mine as efficiently as complicated power machines furnish fresh air to the larger mines, and at no cost since the installation of the simple apparatus. This mine has a single shaft, which of course does not favor the circulation of air. An air duct of boards, extending from the mouth of the shaft to the bottom of the mine, was put in by the owner, who then attached to this a piece of canvas, shaped like half of a funnel. The open side of the canvas is kept turned windward, catching and directing air currents into the duct, which carries the breeze to the bottom of the mine. The cost was insignificant.



The Canvas Half Funnel, Installed at a Nevada Mine, Catches the Winds and a Wooden Duct Carries the Air to the Bottom of the Shaft

RAILROAD RUNS TRAILER CAR FOR SPORTSMEN'S BENEFIT

A trailer car, designed and run especially for the accommodation and convenience of sportsmen, is a peculiar feature of railroad operation in the valley of the Hood River, northwestern Oregon. The car is sidetracked in the woods and used as a camp by parties of hunters and fishermen visiting the upper valley, in the vicinity of Mt. Hood, thus eliminating the tent problem and providing excellent sleeping quarters. Being lightly constructed, it adds little to the haul, yet its curtained sides afford ample protection to its patrons, who would scorn luxury.



Trailer Car for Sportsmen, an Odd Feature of an Oregon Railway Line: The Car is Sidetracked and Used as a Sleeping Tent by Hunting and Fishing Patrons of the Road, Who, by Dropping the Side Curtains, are Protected Even from Storm

CAMP GRANT SITE BOUGHT BY WAR DEPARTMENT

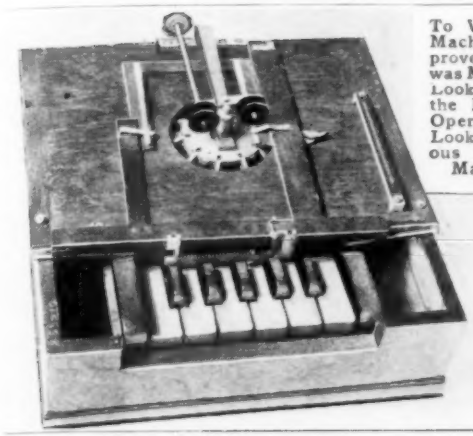
Four thousand acres of land in Winnebago County, Ill., on which stand the buildings of Camp Grant, one of the larger national army cantonments, have been purchased by the War Department to be used as a permanent military reservation. A total of $800,000 was paid for the tract, the price per acre ranging from $150 to $350. When the United States entered the war, the land was leased from the owners, and the decision to purchase it was not reached until the mobilization center was designated as one of 14 such camps to continue indefinitely as army posts. Most of the land was bought at a price set by agreement between the owners and representatives of the War Department, but in a few instances condemnation proceedings were necessary before the land could be transferred to the government.

¶ The government realized only 12 per cent of its original expenditure in the recent sale of 2,716 biplanes and 4,608 airplane motors to a private corporation.

COPYRIGHT, UNDERWOOD & UNDERWOOD

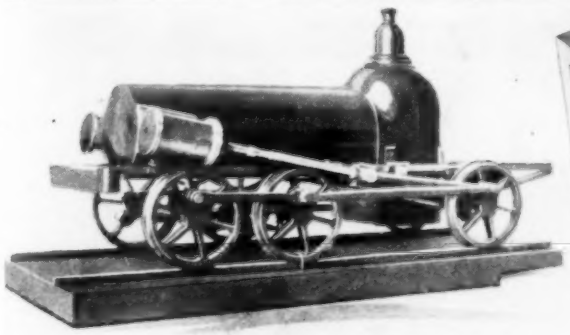
TRANSATLANTIC FLIGHT ENDS IN IRISH BOG

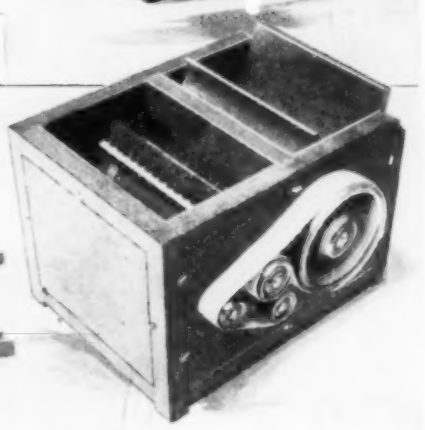
THIS is the transatlantic Vickers-Vimy bomber exactly as it nosed into the spongy bog at Clifden, on the completion of its 1,950 mile flight from Newfoundland. The condition of the plane explains why Alcock and Brown did not continue the flight to London, as planned. Captain Alcock is said to have admitted that he chose for a landing field "the softest spot in Ireland." The plane was later dismantled after identification of the seals by officials of the supervising aero club.



To What Extent Sewing Machines have been Improved Since the First One was Made can be Judged by Looking at the Picture on the Right. This Crank-Operated Mechanism was Looked Upon As a Marvelous Invention When It Made Its Initial Bow

From the Crude Machine Shown Above Grew an Office Device without Which Modern Business would be Lost. It Resembles a Toy Piano, but Is an Early-Model Typewriter





Some of the Features of Modern Locomotives can be Seen in the Model of a Pioneer Railroad Engine Illustrated Above, but the Pioneer Probably Had Little Speed or Endurance. Eli Whitney's First Cotton Gin, at the Right, Is Not an Impressive-Looking Machine

MODELS SHOW PROGRESS MADE IN MECHANICS

People of today, viewing prototypes of machines in common use in everyday modern life, found themselves puzzled when they attempted to identify first and early models in a recent exhibition at Washington, D. C. One of the most puzzling of these models was that of one of the early typewriters, which resembles a child's piano more than a writing machine. It has but 11 keys. Other models shown included Eli Whitney's original conception of his famous cotton gin, an early type of the Baldwin locomotive, and one of the first sewing machines patented in this country.

¶Life preservers of stamped copper are said to be more buoyant and much more durable than the conventional cork and canvas form.

CLAMP FOR BALL RACES IS NEW GARAGE TOOL

Well-equipped garages are often called upon to handle such small and accurately finished parts as the ball races of generator and motor bearings. A new puller clamp designed for this work, used in connection with a 20-ton press, consists of two heavy side brackets supporting a pair of spring-steel plates, with notches of graded sizes in their adjacent edges. Adjusting thumbscrews in the brackets adapt the clamp to work of varied dimensions, the notched plates locking securely into the ball-race groove. The clamp is made in two sizes, with 9 or 16-in. plates.

Popular Mechanics features will appear in movi-a pictures issued by Paramount Magazine

WING FENCES PROTECT POWER HOUSE FROM ROCK SLIDES

A power house in the cañon of the Tuolumne River, California, was constantly menaced by rock slides, loosened by operations at the top, and finally a tool shed was practically demolished by a rolling bowlder. To protect the plant, wing fences of heavy timber have been built along the line of the penstock up the steep cañon wall, forming V-shaped guards calculated to divert any incipient avalanches harmlessly to one side. The fences are made of rough logs, fastened with old cable, and supported by stout posts.

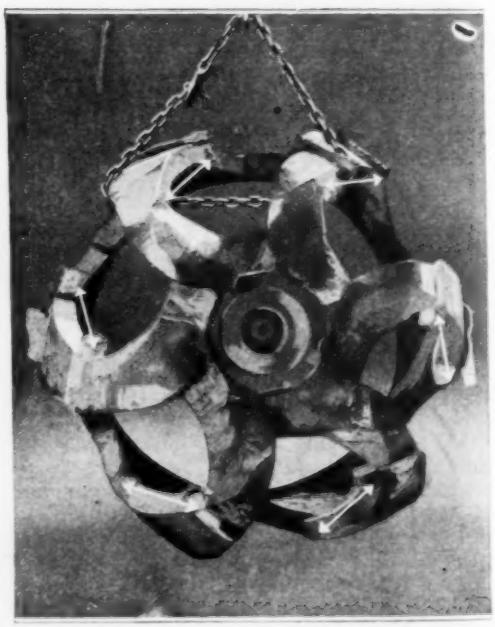
The Wing Fences Seen against the Side of the Cañon are Built of Heavy Timber, Their Purpose being to Protect the Power House from Slides of Rock and Rolling Bowlders

PRIZE OFFERED FOR ESSAY ON FOREIGN RELATIONS

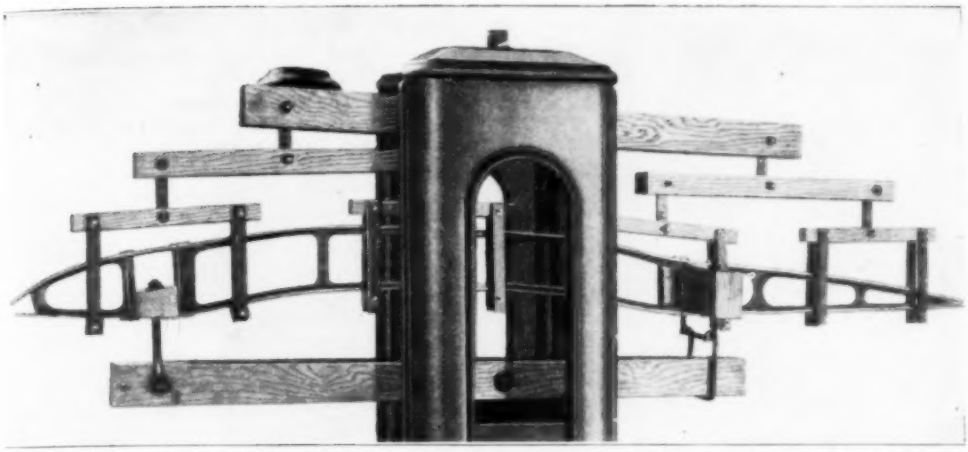
Plans for controlling the foreign relations of the United States, with special attention to the rights, duties, and responsibilities of the president, congress, and the bench, will be outlined in essays to be submitted to the American Philosophical Society, Philadelphia, for a prize of $2,000 in gold. Under the rules of the contest the essays are to be less than 1,000 words in length, but may be written in any language, provided they are accompanied by English translations. Essayists will identify their work by pen names or mottoes, their proper names to be sent in sealed envelopes which will not be opened until the judges of the contest, five in number, have chosen the winning essay. Contestants may submit essays at any time before the end of 1920. The award will be made from the Henry M. Phillips Prize Fund, presented to the society by a Philadelphia woman in honor of the memory of her brother.

BIG ROTARY DREDGE CUTTER REPAIRED BY WELDING

After long service in chewing up the bottom of the Columbia River, to facilitate dredging operations, the massive blades of a 2½-ton revolving dredge cutter were found recently to be practically worn through. The unwieldy cutter was operated upon, and a 26-in. section cut from one blade. A new steel blade, 11 in. wide and 3½ in. thick at the back edge, was then welded in place by the thermit process. The first finished, the second blade was repaired in the same way, and so on around the circle of six. In this work 1,120 lb. of steel was used, and something less than 800 lb. of thermit.



Dredge Cutter Head Repaired, by Thermit Welding, with Six New Blades, Each 26 Inches Long, 11 Inches Wide, and 3½ Inches Thick



The Machine for Testing Airplane Wing Ribs Distributes the Stresses Exactly as the Rib Receives Them in Flight, by an Arrangement of Levers Somewhat Reminiscent of the Evener on a Horse-Drawn Vehicle

A WOOD THAT IS STRONGER THAN STEEL

How Waterproof Plywood, Discovered by Yankee Experts, Revolutionized Airplane Construction, and How It will Enter into Post-War Industry

By E. T. BRONSDON

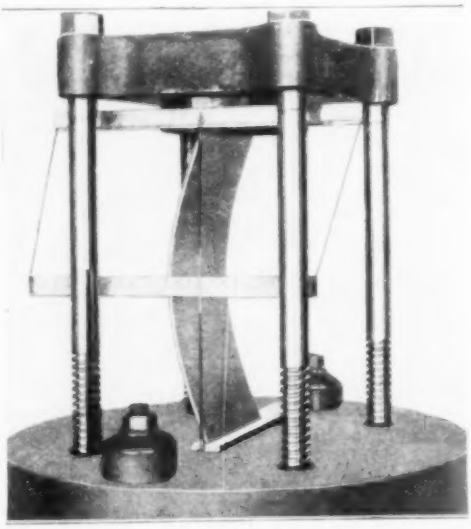
"SEE this toothpick?"

The Forest Products Laboratory expert who was starting to demonstrate plywood to me extracted a small polished wooden sliver from one of his vest pockets.

"Now, you wouldn't believe that in one way, weight for weight considered, this is stronger than a steel bar, would you?"

I admitted that it sounded improbable.

He did not bother to argue. Adjusting a fine balance scale, he placed the toothpick on one of the pans, and brought the arms to horizontal by laying a 3-in. length of light steel wire on the other pan. The weights were equal, and the lengths the same.



The Panel of Plywood being Tested in the Machine Bends, of Course, but It must Not Break under the Maximum Stress, Which Is a Great Deal Higher than It would Ever be Called Upon to Carry in Practice

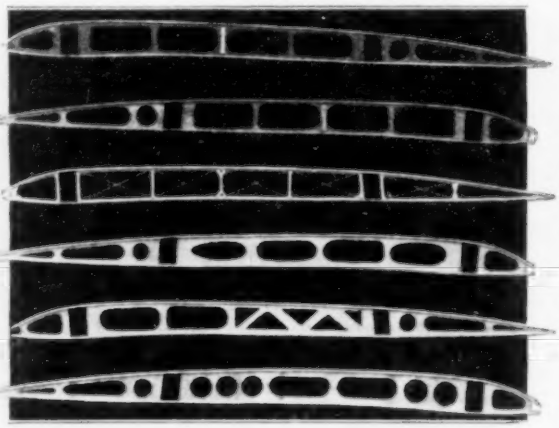
Then in a small testing machine he proceeded to apply tension to the steel wire. At 29 lb. the steel gave way. Then he fixed the toothpick in place, taking care not to crush the wood fibers. The increasing tension tended to pull the toothpick apart in the middle—the grain, of course, running lengthwise. At 74 lb. the toothpick failed.

He looked disappointed, and immediately offered excuses. The toothpick should have withstood 100 lb. or more, but evidently the testing machine had harmed its resistance. Also, a sliver of yellow poplar, Sitka spruce, or Douglas fir would do better than white pine. . . .

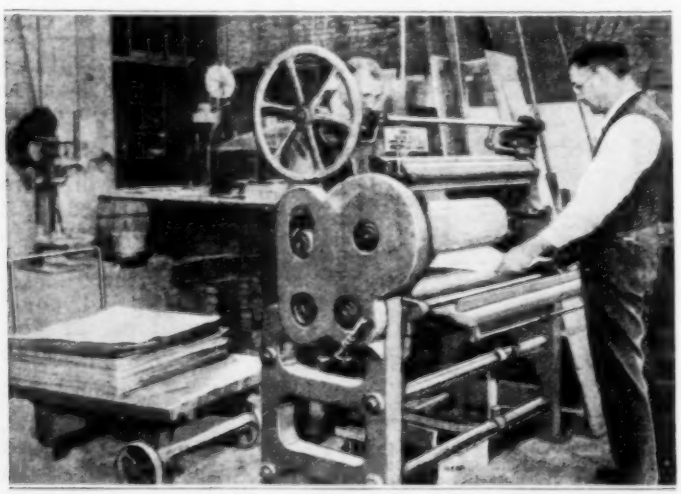
I was willing to take his word for it now, however. He went on to tell me how the denser woods all could beat steel in this test by from 300 to 600 per cent, but that when tested across the grain, the best of wood showed only from one-fourth to one-half the strength of steel. "That's why plywood was invented," he commented.

Plywood essentially is a piece of wood of any variety, cut by a machine into thin panels, and glued together again in such manner that the grain of one panel runs

at right angles to the grain of the two adjacent panels. In order to understand this perfectly, let us suppose that a 1-in. square of Georgia pine, ½ in. thick, be cut into four 1-in. panels each ⅛ in. in thickness. Let us place the first on the table before us so that the grain runs north and south. On top of this let us glue the second panel, the grain running east and west. The third follows, grain north and south, while the fourth is east and west again. The completed article is a small section of a plywood panel, the strength of which, in two planes, greatly exceeds that of steel. With some woods, by combining cuts, it is even possible to secure greater resistance to stress in all three planes than steel affords, though it is rarely necessary to go so far. Ordinarily wood used in construction, as for airplane wing ribs, engine bearers, and the like, is not required to withstand severe stresses in more than two of the three planes. What the development of plywood has meant to airplane construction is well illustrated by the instance of the De Haviland-4. Before plywood, the best airplane wing rib developed weighed 7.95 oz., and was capable of sustaining a load of only 91 lb. The first plywood wing rib made by the Forest Products Laboratory weighed 6.93 oz., and sustained a load of 109 lb. Since then, although a wire-strengthened rib was invented by these experts capable of sustaining 254 lb. with a total weight of 6.30 oz., the plywood rib has improved still further. The rib last used on the De Haviland weighed 5.12 oz., and could carry 274 lb.; this was a clear "edge" for plywood of 32.75 per cent in strength per ounce of weight. Only an airman, trusting his life continually to the wings of his cloud steed, can appreciate fully what one-third more strength for the same weight means to him.



Various Forms of Airplane Wing Ribs have been Constructed of Plywood, with Constant Improvement. All of Them Are Stronger Than Steel, the One Braced with Wire Supporting 254 Pounds and Weighing Only 6.3 Ounces



The Veneer Cores for the Plywood are Passed between Two Heavy Rollers, the Lower of Which Revolves in a Bath of Special Glue

It would be of interest only to an aviation fan to detail all the places in an airplane where plywood now is used. Suffice it to say, that in the best machines, now practically every part of the fuselage subject to strain, and several other parts, are made from plywood. So admirably has this construction material proved, that forest-products experts have started extensive experiments on the wings themselves, of which it just now is permissible to speak.

Heretofore varnished linen has been practically the only material with which

wings have been covered. At the laboratory, however, a process was invented late in 1918 of making plywood so thin as to be suited for the same purpose.

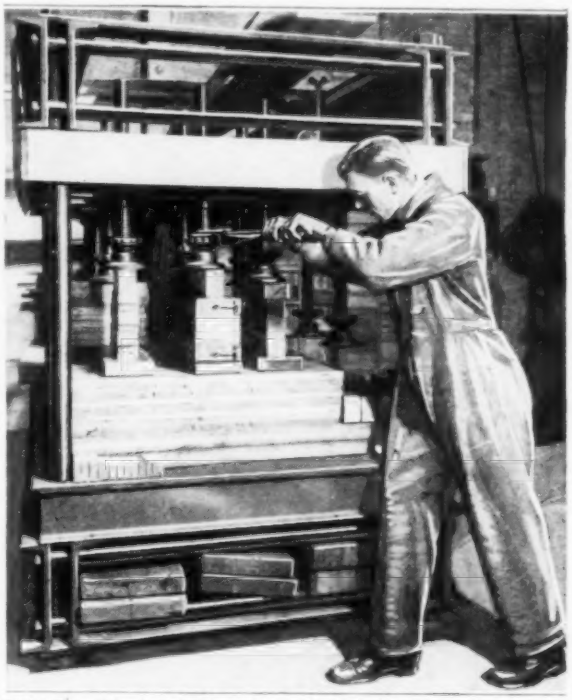
In doing this, the panels are cut .01 in. in thickness, in squares of 3-ft. length. Under any process of gluing used up to 1918, it was impossible to make sheets of this thickness stick together without disintegrating. The glue soaked through, causing warping and other troubles. The new gluing means consists in coating thin sheets of tissue paper with blood glue, letting it dry, and then applying the plywood panels to each side in a steam-heated press. The resultant material, 1/40 in. thick, is surprisingly strong.

This extremely thin plywood actually was tested on airplane wings built especially for the purpose. Though with its first development it did not seem sufficiently superior to linen to cause an immediate displacement of the latter, it nevertheless gives between six and eight per cent added lifting power for the reason that the "flap" of the cloth is eliminated entirely. Weight for weight, its strength is approximately the same; in the future it is quite likely that all wings may be covered with this material.

When plywood was first thought of in connection with airplanes, an apparently insurmountable difficulty presented itself. A machine that had to be out in all weathers and spend much of its time in dense fog and in thick clouds—often approaching 100-per-cent humidity for long periods—must not be held together in any way by glue that water could dissolve. Though several so-called "waterproof" glues were on the market, not one of them showed satisfactory strength when subjected to wetting. Also, these glues were secret preparations, for which the government would have to pay a high premium.

The laboratory experts, however, busied themselves with the problem and evolved two new glues, one made from the blood of animals and one derived from casein—obtained from milk. Panels were glued together with these and tested.

The plywood test pieces were boiled in water for eight hours. At the expiration of this time none of the pieces showed any separation of the plies. Soaking in cold water for 10 days gave the same result.



Only Test Blocks of Plywood are Finished in This Machine, the Glue being Dried under Pressure of the Screws

The blocks were tested in a shearing machine, which applied force in such a manner as to push one ply from another. In this test a pressure of from 250 to 700 lb. to the square inch of glue surface was required to separate the layers, so strong were the new glues, and even then it was, in most cases, not the glue, but the wood fibers themselves, that gave way. After boiling the test pieces for eight hours, the average pressure exerted amounted to 180 lb., and after soaking them for 10 days the plies defied pressure up to 200 lb. Since the specifications for airplane plywood demanded only that the material exhibit a strength sufficient to withstand a pressure of 150 lb. to the square inch when dry, the new glues were accepted with acclaim. Also, as an added feature, it was demonstrated that, after drying again, the blood glue regained all but six per cent of its original strength, while the casein glue lost only 18 per cent in the tests, which, of course, were much more severe than any conditions a

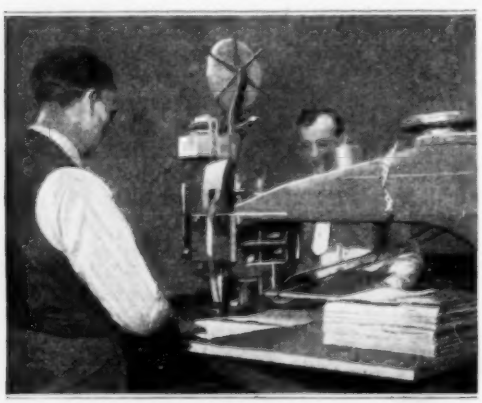
service airplane would ever be called upon to withstand.

In the case of thicker joints—blood glue is used only for veneer, where it can

The Board being Spread with Glue in the Wringer-like Machine is to Form One Layer of a Piece of Heavy Plywood

be pressed by steam-heated plates—the new casein glue exhibited remarkable strength. With blocks of maple having the grain running in the same direction, a shearing strength of from 2,000 to 2,500 lb. to the square inch was found to be common.

These new glues saved the government over $6,000,000 in the construction of plywood alone. As is the case with all the discoveries of the Forest Products Laboratory not actually needed exclusively for war, the formulas are at the service of American industry. Any manufacturer or private user of glues who wishes to manufacture either of these glues is at liberty to do so. The laboratory will give advice in this respect, and extend experimental help if this is necessary.



An Ingenious Machine for Taping Veneer Joints, Enabling the Use of Small Strips in Making Sheets for Gluing

In considering the application of this new waterproof glue and plywood to industry in our reconstruction period, it becomes evident that an entirely new field has opened for progressive manufacturers of wood articles. Who, till now, has put on the market a standard door that will not warp? Plywood panels cannot warp after they are finished, for one ply holds the next rigidly. What manufacturer has got out a table or chair with glued joints that will not fall to pieces in a damp atmosphere? Furniture made with casein glue will hold together far better.

For cabinetmakers and manufacturers of wall coverings another entirely new aspect appears. The 1/10-in. plywood used as covering for airplane wings naturally retains every beauty and quality of the wood from which it is made. It is capable, in the case of mahogany, Circassian walnut, and other fine varieties, of taking just as high a polish as the thicker veneers used by the trade until this year. Ponder this: The thin plywood will not warp or peel; it can be manufactured from the finest walnut at a total cost of less than three cents a square foot, while for cheaper woods the cost runs in the neighborhood of one cent a foot. This is between one-third and one-tenth the cost of ordinary veneers used for cabinetmaking or for wall paneling. It is so inexpensive that the finished product could be retailed at a price within the reach of the great majority of house owners. Thousands of them, now content with florid wall papers, would use the new plywood paneling. What manufacturer wants the chance to be first in this field?

ANGLE FOR LOST ARTICLES IN SUBWAY VENTILATORS

Retrieving articles lost when dropped through the sidewalk gratings of subway ventilators is a form of dry-land fishing that is popular with many small boys and a few grown-ups in a large eastern city. The tackle used by the pioneers of the game, the small boys, consists of a rock tied on the end of a string and rendered

COPYRIGHT, AMERICAN PHOTO SERVICE

Fishing on Dry Land As It is Done in a Large Eastern City: Small Boys Angle for Articles Dropped through the Sidewalk Gratings of Subway Ventilators, Using Gum-Coated Rocks Tied on Strings. At the Left is Depicted What was Caught by a Magnet and a Hook. In the Center Are Three Fishermen, and at the Right Are Some of the Trinkets They have Retrieved

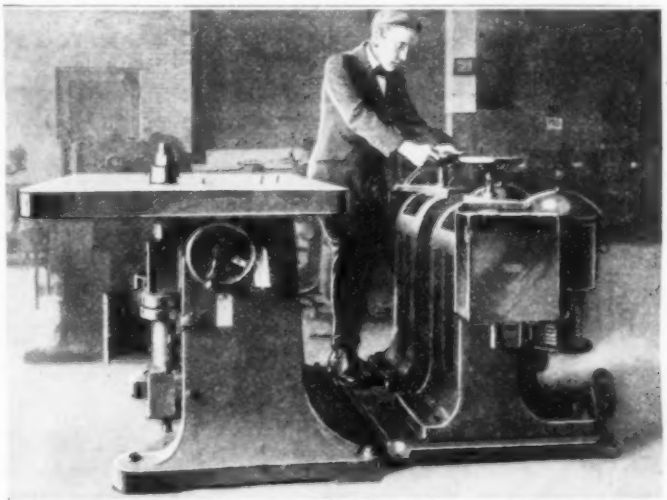
adhesive by the application of a bit of chewing gum. Lowered through the gratings and properly directed, this tackle often brings up coins, fountain pens, knives, nail scissors, jewelry, and other small articles. A systematic probing of the ventilators is conducted by a man who uses a jointed pole with sticky end.

CHINESE CARAVANS VANISH IN FAVOR OF TRUCKS

Four thousand picturesque camels and their 1,000 drivers are to be succeeded by 30 businesslike American trucks for the transportation of freight between Tientsin, China, and Kulja, Eastern Turkestan, a distance of approximately 2,000 miles. An agricultural colonization company is responsible for the contemplated change. Farm products will be carried on the return trip. Each camel of the caravans now traveling the route is capable of carrying only 200 lb. of freight, while each truck, equipped with a trailer, will be able to transport six tons. Traveling at the rate of 20 miles a day, the animals require about six months for the round trip. The trucks are expected to cover the same distance in 30 days. Equipment for two machine shops will accompany the trucks. One shop will be located in Tientsin and the other in Kulja. Stations for supplying fuel, water, and lubricants will be established along that part of the route which traverses arid territory.

EACH SPINDLE ON NEW SHAPER DRIVEN DIRECT FROM MOTOR

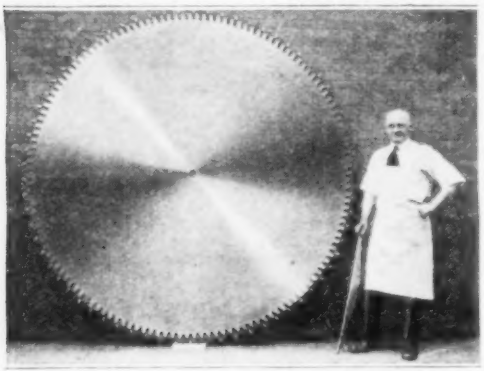
Machines that are easily installed and occupy relatively little space are welcomed in every shop. And such are the merits of a new shaper which mounts, on ball-bearings, two spindles, each driven directly by its own electric motor. This arrangement allows the spindles to work independently, and eliminates line shaft, countershaft, and the other elements of overhead power transmission.



The Demonstrator is Shown at the Adjusting Handwheel of One of the Two Motors Which Drive the Spindles of the Shaper at the Left. The Direct Power Transmission Means Economy in Shop Space

LARGEST CIRCULAR SAW HAS INSERTED TEETH

Replaceable teeth are a feature of what is declared to be the largest circular saw ever put into actual operation. When



This Is the Largest Saw Ever Put to Practical Use. Its Teeth are Inserted in the Big Disk, and When Worn or Broken, may be Replaced

broken or worn, the teeth may be removed from the edge of the steel disk, in which they are inserted, and new teeth substituted. There are 140 of these teeth. In diameter, the great saw is 96 in., and its weight is 594 lb. A sawmill of the Northwest is using the saw, which was made in the East.

HONOR-SYSTEM CANTEEN TEST FOR STUDENTS

Not a clerk is in sight in the coöperative store of an eastern university. Student customers not only select their purchases, but they wait on themselves, make change

The Man in the Picture Is Customer, Clerk, and Cashier in This Honor-System Canteen of an Eastern University

in the cash register, and ring up the amount of the sale. All the manager of the store has to do is to replenish the stock and take care of the receipts at the end of each day. The canteen system was put into operation for the purpose of testing the honesty of the students and to democratize the school.

FIRST TRANSATLANTIC FLIGHT RECORDED IN PICTURES

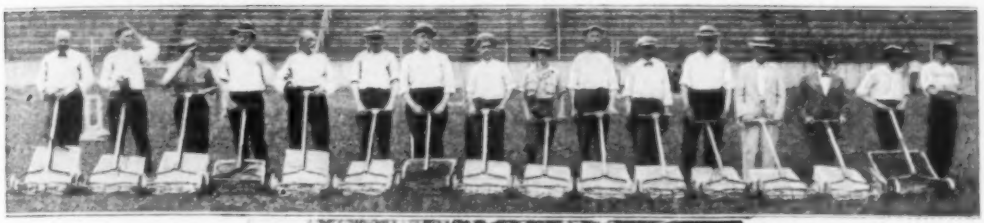
It is now learned that every item of the navy's transatlantic flight program was recorded in pictures for the archives of the department. The story begins with drawings, sketches, and photographs of the construction of the four NC planes, capped by trial flights and alterations at Rockaway Beach, L. I. Then come several thousand feet of motion-picture film and several hundred photographs showing scenes at Halifax, Trepassey, Ponta Delgada, Lisbon, and Plymouth. In addition, a navy airman with experience as a painter served as official artist for the undertaking. During a three weeks' stay at Ponta Delgada he painted in oil nearly a dozen dramatic incidents of the flight.

PREVENTION OF EXPLOSIONS OBJECT OF CAMPAIGN

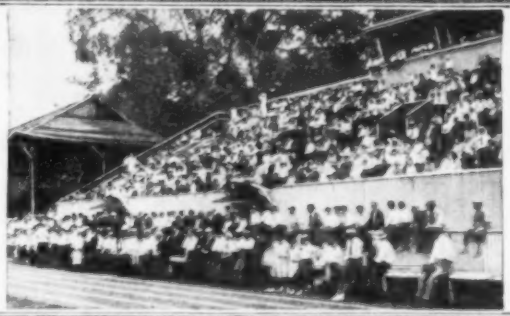
Stirred to greater efforts by numerous grave and costly disasters in grain mills, elevators, and similar plants, the Department of Agriculture has instituted a vigorous campaign which has as its object the prevention of grain-dust explosions. Danger from this source can be practically eliminated, government experts declare, by the employment of methods and devices that have been tested by the department. During the 18 months preceding the beginning of the campaign 39 persons were killed, 60 injured, and 2,500,000 bu. of grain and $8,000,000 worth of property were destroyed in six grain-dust explosions and the resultant fires.

GRASS-MOWING RACE ENDS ARGUMENTS OVER LAWNS

When it became impossible to decide by ordinary means which of two streets in an Ohio town had the better kept lawns, a grass-cutting contest was arranged between two teams, each representing one of the streets and composed



Above Is One of the Lawn-Mowing Teams. Its Members Wore Dark Trousers to Distinguish Them from Their Opponents



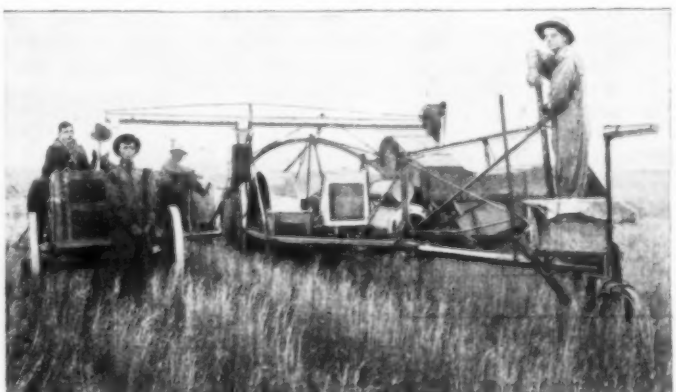
Many Neighbors and Friends of the Contestants, Not to Mention Members of Their Families, Watched the Lawn-Mowing Contest

of men from many walks of life and of all ages. One team member was 82 years old. The contest was held on the athletic field of a large school. Areas of equal size were allotted the two teams for cutting with lawn mowers. At the report of a starter's pistol, the contestants began pushing their machines over the plots at top speed. Though one team finished eight minutes before its rival, the prize was awarded to the slower aggregation for neater work. The mayor of the city in which the contest was held presented the prize. Over 2,000 persons witnessed the contest.

Rival Neighborhoods in an Ohio City Decided to Settle the Question of Which Had the Better Kept Lawns by Holding a Lawn-Mowing Contest. Teams Representing Two Streets Took Part in the Unusual Race. In the Picture Above is Shown One of the Teams as It Looked Before Work was Begun

WHEAT DIRECT FROM HARVESTER TO MARKET

A Nebraska wheat farmer, striving to overcome a handicap of 18 miles to the railroad, almost succeeded in harvesting his crop directly into market. He employed a combination harvester and thresher, which delivered the threshed grain into a relay of wagons that moved along with the machine. When loaded, a wagon turned out to transfer its burden to a waiting motor truck, and an empty one took its place. The full truck raced away to the railroad and deposited its freight—grain that had been growing in the field only a few hours earlier. About 25 acres a day was harvested in this expeditious manner.

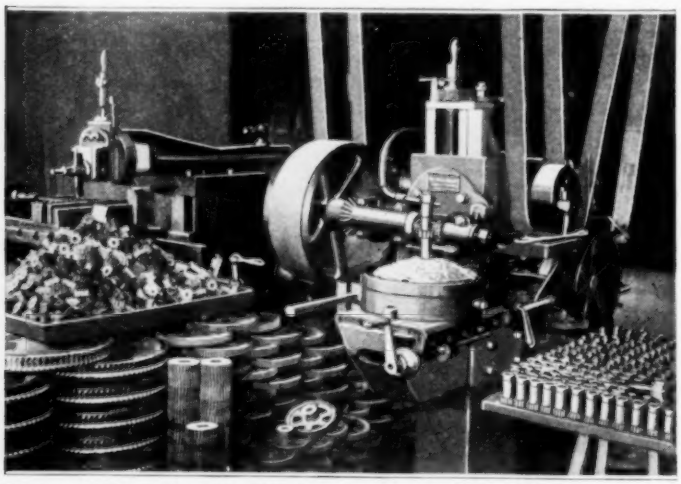


The Wagon at the Left Received Threshed Wheat as It Moved Alongside of the Machine, a Combination Harvester and Thresher. When Full, It Transferred Its Load to a Motor Truck and an Empty One Took Its Place

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine

MACHINE CUTS SPUR GEARS IN SINGLE OPERATION

Spur gears are cut in one continuous operation by a new machine, on which



Because of Its Adjustable Hob Spindle, This Machine may be Set to Cut Spur Gears. The Work is Accomplished in One Continuous Operation, and Several Gears may be Cut at One Time

the spindle of the revolving hob may be set at any angle. In cutting spur gears, the spindle is adjusted so that the hob will cut across the face of the blank parallel with the axis of the gear. The hob is then fed downward, while the blank revolves. Several gears may be placed on the revolving worktable at one time.

RARE ELEMENTS DISCOVERED SUITABLE FOR PAINTS

Paint pigments prepared from radium, tungsten, and other rare elements are recommended by a researcher as possessing high covering power and opaqueness when ground with oil. Selenites of lead and barium give fine, white pigments, while certain derivatives of beryllium and zirconium—more costly materials—yield an excellent product. Other elements suggested for paint making are selenium, molybdenum, titanium, vanadium, and uranium.

¶Houses a mile away from the landing field near Baltimore, Md., were shaken when the navy dirigible "C-8" exploded not long ago, hurling many spectators 20 to 30 ft., and injuring 75 persons with patches of burning fabric.

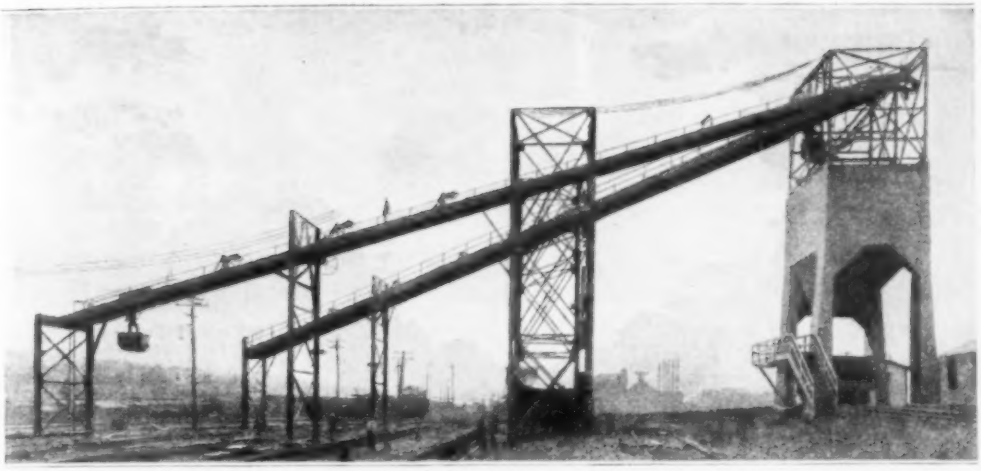
ANCIENT RACING REGULATION BARS SWIFT ANIMAL

Efforts are being made by certain members of the English Jockey Club, under the auspices of which England's classic races are run, for the amendment of an ancient rule of the organization which prohibits a horse from starting in a race if the animal has been sold by the person who made the entry, or if that person is dead. One of the swiftest horses in the history of racing was barred from participation in the Derby, St. Leger, and other important contests because of the death of its owner, an Englishman of royal blood, who had nominated it for these races. Although the new owner of the horse was willing to carry out the engagements made for the animal by the former owner, he was forced to run it only in less important events because of the archaic rule.

PRACTICAL PLASTER BOAT EASY TO CONSTRUCT

Following in the wake of the concrete ship comes the plaster boat, the idea of a western inventor, who declares the construction not only practical, but of merit because such craft are quickly and easily built. Ordinary plaster, such as is used on the walls of buildings, is applied to the inside and outside of a boat-shaped frame to which has been nailed metal lath.

The Graceful Rowboat Shown Here was Made of Plaster, Which was Applied to a Frame of Wooden Strips Covered with Metal Lath



Cinder-Handling Plant Installed in an Ohio Railroad Yard: The Inclined Trestles Serve Four Tracks, between Whose Rails Are Pits That Enable the Traveling Buckets to Receive the Locomotive Cinders, After Which They are Hoisted by Cables to the Storage Tower at the Right

When the plaster is dry the boat is ready for use. Air-tight compartments at each end of the boat prevent it from sinking, even if it is filled with water. A plaster boat, 14 ft. long, with walls ¾ in. thick, weighs 400 lb., and, according to the inventor, can be built in two days by one man.

AIRPLANE TAXIS PERMITTED TO LAND IN PUBLIC PARK

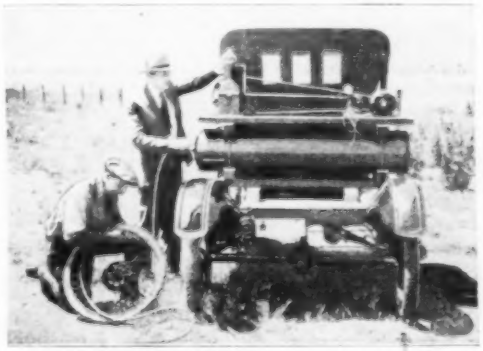
An aerial taxi company of Chicago recently petitioned the park board for a permit to take on passengers in Grant Park, which stretches between the down-town district and Lake Michigan. The commissioners refused to grant the permit, yet told the company to use the park for this purpose until notified to stop.

MODERN PLANT FOR HANDLING LOCOMOTIVE CINDERS

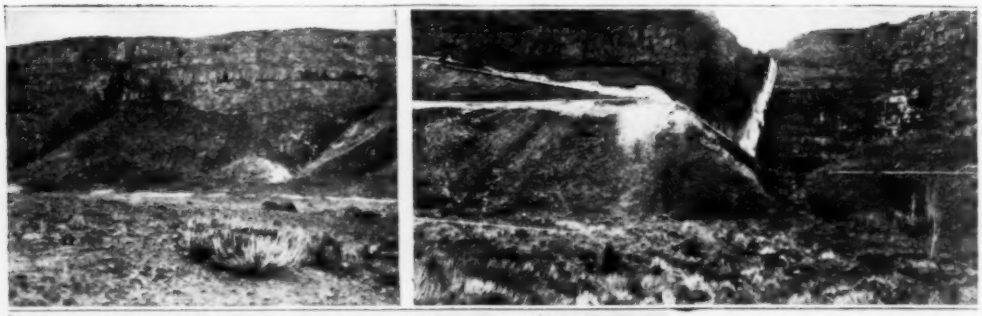
Mechanical handling of locomotive cinders by a specially designed plant, recently installed, has added greatly to the operating efficiency of an Ohio railroad yard. From a concrete storage tower two diverging trestles incline downward, passing over four tracks. Under each track is a pit, 125 ft. or more in length, with rails at the bottom. Buckets running on these rails are readily placed under the locomotives, and then, loaded with cinders, rolled to the end of a trestle. Cables elevate them to the storage tank, where they are automatically dumped. Electric controls prevent overrunning of the trolleys. The storage tank dumps directly into cars beneath its hopper bottom.

PORTABLE AIR COMPRESSOR AIDS MOTOR RACERS

The problem of getting air under pressure to the pits at an automobile or motorcycle race has been solved for one company by the use of an auto-mounted air compressor. The air tank is secured to the frame of a light truck, with the compressor and motor above it. The electric motor is usually operated by "plugging in" on a nearby 110-volt circuit; but if no current is available the motor may be run from the car's storage batteries. The outfit was used for the first time at a recent motorcycle race, when it enabled a rider to change a tire in 40 seconds.



This Electrically Operated Air Compressor Supplies Compressed Air for Tire Inflation at Motor Race Meets and Road Contests



In the Panorama of the Snake River's Beautiful Valley, Much of the Winding and Staggering Auto Trail to the Bottom Is Visible. In the Upper Corner is Pictured the Portion of the Cliff Where the Settler is Reported to Have First Lowered Himself, with Aid of Block and Tackle

FIRE-OBSERVATION TOWER IS HIGH POINT ON LONG ISLAND

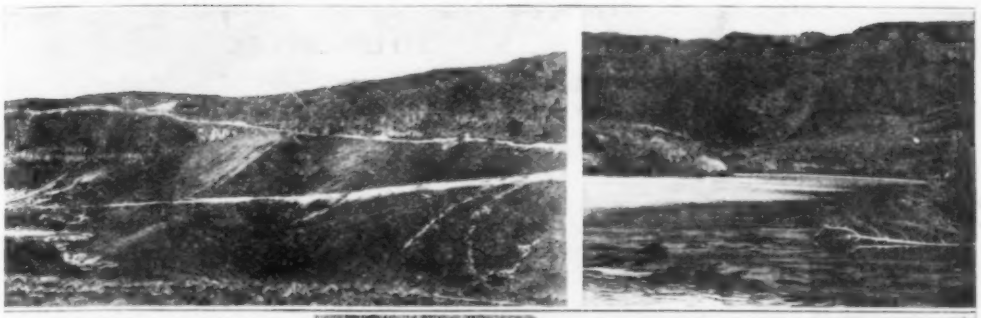
Because of the view to be obtained from its top, a steel observation tower at Selden, L. I., built by the conservation commission of the state of New York for forest-fire watchers, is extremely popular with persons who feel that such a view is worth a long climb. The tower is said to be the highest point on Long Island. It is 70 ft. high, and is located on the summit of a hill 333 ft. above sea level. The upper deck, which is glass-inclosed, is reached by steel stairs. Another tower of similar construction is located at Flanders, L. I. It is 47 ft. high.

The Road Makes Its Sudden—and Not Entirely Safe—Turn at This Point to Avoid a Ducking in the Cold Water of the Cascade Beyond

DROP ROAD DOWN AS ENTRANCE TO

There is a place in Idaho where fruit trees of wondrous productiveness grow out of the spaces between giant bowlders, and are irrigated from lakes that are named "blue" because they are blue,. and not for the usual sentimental reasons. And the only entrance to this curious garden is down a tortuous, twisting trail where the auto driver's heart goes into his mouth as his gears go into "first." It is 800 ft., vertically, from the sagebrush prairie to the oasis. Travelers do not go vertically, of course, except the careless ones; but the angle of depression is sufficiently great, and the way sufficiently narrow and devious, for ample thrill.

The feat of dropping the road down the cañon side was undertaken by the people of Twin Falls, and the site is a little above the famous Shoshone Falls of the Snake River, and 3½ miles from town. A modern bridge of many piers crosses the half mile of river; but getting from the cañon rim to the bridge head is a trick for expert drivers. They look well to the brakes before starting, too, for some of the grades are so long and steep that they are needed all the way. Only a low stone wall guards the abyss, and turnout points are scarce. Once the road followed a ledge along the cliff, passing behind a silvery cascade whose spray, beautiful but wet, frequently deluged the bold traveler. But now the trail abruptly turns about be-



A Good View of the Road Down the Cañon Side, Both Above and Below the Point Where It Makes Its Quick Reversal of Direction

CAÑON'S CLIFFS STRANGE GARDEN

fore it reaches the waterfall, and backs to another level. So sudden is the turn that the larger cars must back and fill to negotiate it. One driver backed clear off the precipice some time ago—and escaped with his life, though parts of the car might still be found. Many visitors prefer to walk.

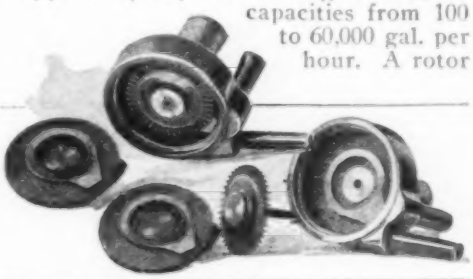
In spite of the tons of huge bowlders that clog their aisles, the orchards in the valley (whose owner "settled," it is said, with the aid of block and tackle) produce fruit of exceptional quality, and in early season because of the sheltered climate. Irrigating water is taken, by ditches and big iron pipes, from the Blue Lakes, and their outlet, Alpheus Creek. The bottom of these waters is lined with a deposit as blue as indigo; yet they are marvelously pure and clear. The lakes themselves are thought to be the outlet of Lost River, which disappears in the ground some distance away. Many of the streams in that strange valley appear only to vanish again; and Alpheus Creek itself might well be Coleridge's "Alph, the sacred river," which "ran, through caverns measureless to man, down to a sunless sea."

There are plans for making the treacherous trail a part of the state highway, and in that event the engineers say they can reduce the grade to a uniform eight per cent. Then it will be less interesting, perhaps, but a great deal safer, and so enjoyed by more visitors.

The Orchard Whose Trees Grow between Huge Bowlders, by Standing on Which the Fruit may be Picked without a Ladder; It Is of Unusual Quality: In the Upper Corner Is One of the Blue Lakes, the Sands of Its Bottom Coated with an Indigo Deposit, but Its Waters Pure and Clear

SIMPLE PUMP OF NEW DESIGN HAS SINGLE MOVING PART

Extreme simplicity marks the design of a type of pump now being offered in capacities from 100 to 60,000 gal. per hour. A rotor



Above Is the Pump Assembled, with the End Plate Lying at the Left; Below, the Three Parts, End Plate, Rotor, and Case, are Separated

whose periphery carries a calculated number of radial vanes revolves in a case with an annular chamber, into which the intake and discharge pipes enter side by side with a dividing wall between them. The pump is not centrifugal, the rotor vanes merely impelling the water along the annular passage. There are no frictional contacts except at the bearings. The 100-gal. size is no larger than a watch.

BIRDS TRAVEL COMFORTABLY IN IMPROVED CAGE

The hardships of travel have been reduced to a minimum for live birds by a shipping cage invented by a Los Angeles dealer in feathered pets. It is almost impossible to place the box in any position except right side up, but if this should be done, several transverse perches and one longitudinal perch provide places for the occupants to stand in upright positions. Large, screened air vents are recessed so that the air supply cannot be shut off by the piling of other packages around and on top of the cage. Unspillable food and water containers assure these necessities to the winged travelers en route. The cage is painted a brilliant yellow, and is labeled "live birds" in large red letters on all sides.

CLOCK OF AEROPLANE PARTS MADE BY NAVAL AIRMEN

A clock made from parts of an aeroplane by American sailors stationed at a naval aviation base in England was presented by them to an Englishwoman of the nobility as a Christmas gift. Mounted on a polished base is the piston of a Liberty motor, to which the timepiece is fastened. Near the top of the piston, and directly over the face of the clock, the word "Liberty" is engraved. Surmounting the whole is a metal eagle with outspread wings and a shield covering its body.

RAILROAD USES GUNPOWDER TO OPERATE GUN HAMMER

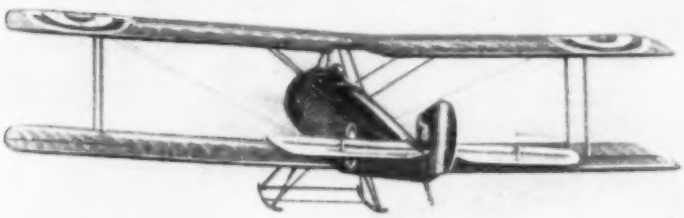
Black gunpowder of the kind ordinarily used in sporting ammunition is employed as a timesaver in the shops of an eastern railroad for operating a gun hammer which removes obstinate nuts and bolts, breaks up iron or steel for scrapping, forces locomotive pistons that are bound by rust or corrosion, and breaks metal that has become cold in furnaces. A steel barrel, into which is fitted a plunger of the same material, is loaded with the powder, the charge varying with the nature of the work to be done. With the muzzle of the barrel about one inch from the object to be struck, the charge is set off. A strong quick blow by the plunger is the result. Several sizes of these gun hammers are used, the length and bore varying for different kinds of work.

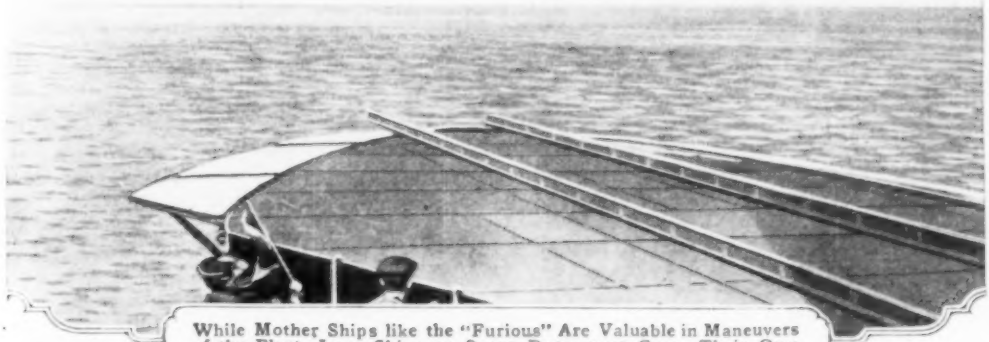
LARGE TYPEWRITTEN LETTER SENT TO CONVENTION

An invitation sent by an association of hotel keepers of Atlantic City, N. J., to a national convention of Rotarians in Salt Lake City, Utah, is stated to be the largest typewritten letter ever inscribed. It was written on a page 20 ft. long and 10 ft. wide by a gigantic typewriter, 21 ft. wide and 15 ft. high, which weighs 14 tons. An enlarged reproduction of the association's letterhead was printed at the top of the sheet, and the letter was signed by the president of the association. By the letter the Rotarians were invited to hold their next convention in Atlantic City. The typewriter, which originally formed an exhibit at the Panama-Pacific Exposition, was described in the April, 1915, issue of the Popular Mechanics Magazine.

REMODELED BATTLE CRUISER IS FLOATING AERODROME

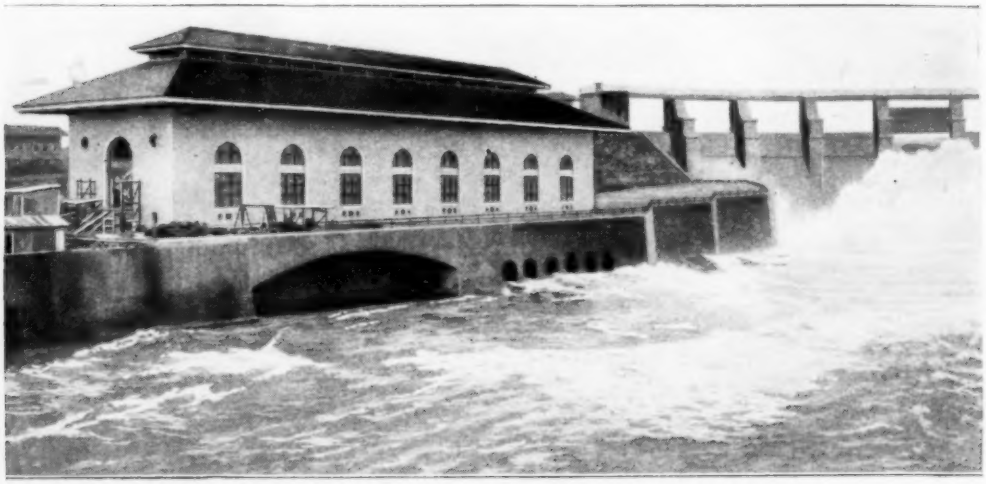
The airplane ship "Furious" is one of the most remarkable vessels in the British navy. Originally designed as a fast battle cruiser, it was remodeled during the war for the less exciting but equally important task of mothering the airplanes and dirigibles which have come to play such essential parts in the maneuvers of the fleet. Forward and after decks were both covered by broad platforms to provide landing areas. Connecting runways allowed the planes to be rolled from one area to another.





While Mother Ships like the "Furious" Are Valuable in Maneuvers of the Fleet, Lone Ships on Scout Duty must Carry Their Own Airplanes. The Problem of Launching Them from the Narrow Decks has been Met in Various Ways. Runways are Laid on Some Battleships along the Big Guns; on Others, Temporary Platforms are Erected on Forward or After Deck. The Plane in the Photograph has Just Risen from a Platform of This Kind

This Is the British Cruiser "Furious," Ship of Mystery, Rumored to have Crossed the Atlantic in Three Days. Some Foundation for the Story is Seen in the Structure of the Vessel, Built Long and Narrow Like an Overgrown Destroyer. After a Short Career as a Superdestroyer It was Converted into a Mother Ship for Seaplanes. Permanent Launching Platforms Carried on Steel Columns were Substituted for Forward and After Turrets with Their Heavy 15-Inch Guns



The Hydroelectric Plant at Gatun, Canal Zone, in Process of Reconstruction to Increase Its Capacity: The Plant Operates at a Head of 75 to 80 Feet and will Use, at Full Capacity, 3,260 Cubic Feet of Water a Second. At the Right, One of the Spillway Gates is Seen Open

CONDUCTS PROFITABLE SHOP IN NARROW QUARTERS

Not all profitable enterprises are large, as is proved by the razor-blade sharpening business conducted by a woman in a western city. In spite of the fact that her shop is but 23 in. wide, she declares her financial returns from the place to be satisfactory. A door forms the front of the shop, and to this is fastened the sharpening machine. In the upper portion of the door are windows, one of which opens for ventilating purposes and the transaction of business.

Although This Razor-Blade Sharpening Shop Is Only 23 Inches Wide, It Returns Satisfactory Profits to Its Woman Proprietor

GATUN HYDROELECTRIC PLANT DOUBLES ITS OUTPUT

So great has been the demand for electric current along the Panama Canal that the output of the hydroelectric plant at Gatun, originally 6,000 kw., has been more than doubled, and provision made for still greater capacity. The three 2,000-kw. generators installed in 1913 are now running at overload. Driven by new wheels of increased power, they are giving 2,880 kw. The station building has been doubled in length, the addition accommodating three 4,500-kw. machines. One of these is already installed, giving a total present capacity of 13,140 kw. The penstocks for the three new units are of reinforced concrete, 12 ft. in diameter. At its ultimate capacity of 22,140 kw., the plant will use 3,260 cu. ft. of water a second, at 75 to 80-ft. head. An auxiliary oil-burning steam booster plant, at Miraflores, carries two-thirds of the capacity of the Gatun station. Part of the transmission line operates at 44,000 volts.

PRINCE OF WALES TO START INTERNATIONAL AIR RACE

An unusual international air race has been scheduled for August 25. Contestants will start simultaneously from Toronto, Canada, and New York, the winner to receive a cash prize of $5,000. More than 40 entries are expected to be drawn by the attractive stake, and by the fact that the Prince of Wales will act as official starter.

SPRINKLER WAGONS WASH CITY STREETS WITH SHEEP DIP

Taking "Odorous but Aseptic" as its motto, the health department of a large city recently ordered that every principal street be washed with a solution of sheep dip. One gallon of the liquid was mixed with every 70 gal. of water, and in this proportion was applied to the pavements by the city's sprinkling wagons. This measure was one of many adopted by the city council in its fight against the Spanish influenza.

FLY PILOTLESS AEROPLANE OVER LONG COURSE

Indicative of the success being attained by experimenters with pilotless aeroplanes, a French machine of that type recently flew 112 miles in a course determined by those in charge of the wireless apparatus which controls the steering mechanism. At the conclusion of the flight, which was witnessed by the French director of aviation, a successful landing was made at a chosen aerodrome.

TAP AND DRILL STANDS SIMPLIFY SHOP WORK

Of value to the toolmaker and stockkeeper is a new tap and drill stand, resembling a miniature metal table, in the top of which are holes for holding upright these tools. Smaller sizes hold a body drill, a tap drill, and two taps. In the larger sizes there are holes for a body drill, a counterbore, a tap drill, and taper, plug, and bottoming taps. Each hole is marked. A complete set includes 16 stands of various sizes on a wooden tray

Taps and Drills are Held in Convenient Positions by These Stands. Each Tool Hole is Marked

STRANGE PARACHUTE EQUIPPED WITH PROPELLER AND RUDDER

One of the strangest parachutes to be patented thus far resembles a Chinese umbrella, with a foot rest, a propeller,

In This Manner the Inventor would have the Airman Escape from a Burning Plane. The Propeller and Rudder Carry Him to a Desirable Landing Field

and a rudder fixed to the lower end of the "handle." It is the inventor's idea that this propelling and steering arrangement will enable the airman to guide himself to a desirable landing place. In practice he would have the airman remove the folded parachute from a rack beneath the upper wing, step out of the fuselage and upon the platform, finally releasing the parachute. During the descent the airman turns two cranks on the "handle," thus revolving the propeller and giving the parachute horizontal as well as vertical motion. The inventor does not claim to have descended in his invention.

¶Streams formed by melting snow have been used to sluice snowslides from the government railroad tracks between Anchorage and Seward, Alaska. Three slides recently blocked traffic on the road. Two of these buried the track under 50 ft. of snow, while the third was 25 ft. thick.

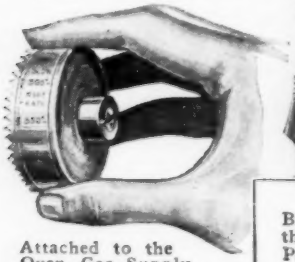
SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

Ferrules on the Handle of a Late-Pattern Ice, Tea, or Lemonade Spoon Hold an Ordinary Paraffined-Paper Straw

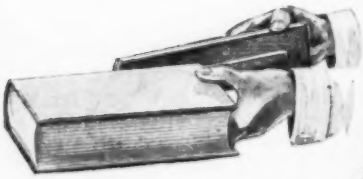
Not Only does This Noiseless, Electrically Operated Machine Wash the Air, but Heats or Cools It According to the Season. It is Used for Ventilating, Drying, Deodorizing, or As a Simple Fan

Brooms Made of the Leaves of the Date Palm, Common in Some Parts of the Country, have Given Satisfaction, and are Said to be Dustless. A Floor Broom and a Whisk Broom of This Material are Shown in the Picture

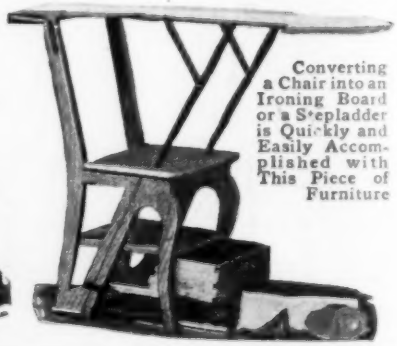
Two Chemicals are Held Separately by a New Fire Bucket Particularly Suitable for Use in a Private Garage. When Thrown on a Fire, the Liquids Unite to Form a Fire-Smothering Gas



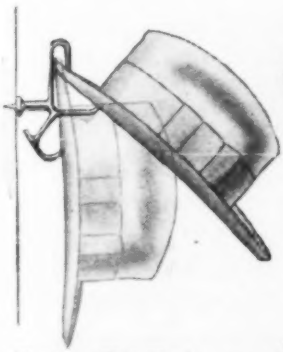
Attached to the Oven Gas-Supply Pipe, This Device Controls the Flow of Gas to Keep an Even Heat in the Oven at Any Desired Temperature



Thieves Are Not Likely to Suspect a Book of Containing Jewels. This Case Looks Like a Printed Volume, but It can be Securely Locked



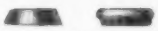
Converting a Chair into an Ironing Board or a Stepladder is Quickly and Easily Accomplished with This Piece of Furniture



Hung on This Hook, a Hat is Held in Place by a U-Shaped Guard, Which Also Serves as a Holder for Garments of Delicate Material. Below the Hat Hook Is a Projection to Hold a Razor Strop or Umbrella

On a Bracelet Recently Offered for Sale the Links, Beads, and Crucifix of a Rosary are Placed in Relief

Cut Roses Have the Appearance of Growing Flowers in This New Vase. The Upright Metal Tube Holds Water and Resembles a Rose-Tree Stalk



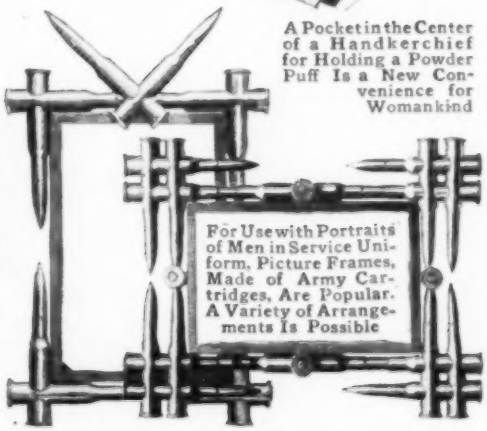
This Simple but Effective Tool Crimps Crown Caps on Bottles, and Requires Little Strength or Skill to Operate. It is Designed for Household Use

Hair Wound around a New Aluminum-Wire Curler is Held Firmly in Place by an Elastic Band, Looped from a Ring at One End to a Crotch at the Other

Though Tiny, This Vanity Case, Concealed in the Frame of a Mesh Bag, Holds a Small Powder Puff and a Supply of Face Powder. A Mirror is Disclosed When the Catch That Fastens the Spring-Actuated Lid is Released

A Pocket in the Center of a Handkerchief for Holding a Powder Puff Is a New Convenience for Womankind

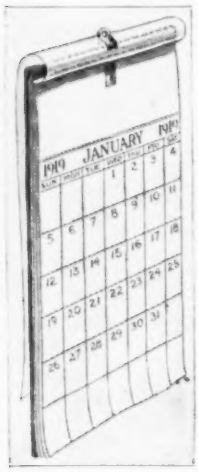
Tools and Mending Materials in Great Variety are Contained in This Neat and Substantial Household Kit, Which is Equipped with a Lock and a Handle, and Reinforced at the Edges and Corners with Metal. The Tray is Lifted When the Lid is Raised



For Use with Portraits of Men in Service Uniform, Picture Frames, Made of Army Cartridges, Are Popular. A Variety of Arrangements Is Possible

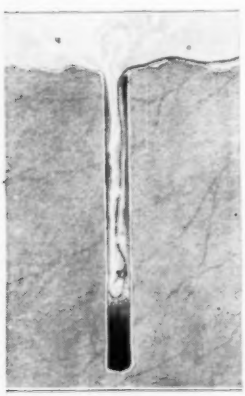
IMPROVED WALL CALENDAR IS PERMANENT DIARY

An improvement in the familiar wall calendar used for advertising display has appeared. It is featured by a small rectangular opening in the upper portion of each page, which makes it possible to fold a page back over the eye or hook on the last day of each month, instead of tearing it off as is now the custom. Thus the page may be used as a conspicuous daily memorandum during the month, and on the last day may be turned back to become a permanent record or diary for reference during the year.



ELECTRIC-LIGHT GLOBE BOILS WATER OUT OF DRILL HOLE

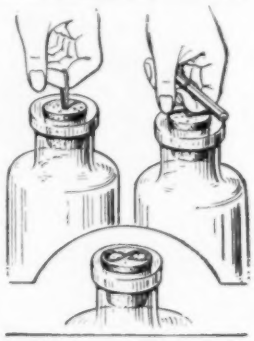
After a three-inch drill hole had been bored into a huge rock preparatory to a blast in a western mine, a rainstorm filled the hole to a depth of about two feet. The hole in the rock was about six feet deep, and as the blast had to be placed in the very bottom to insure best results, the problem of getting the water out was a difficult one. Building a special pump and taking the water out of the hole was considered, but could not be accomplished without considerable delay and expense, and siphoning was out of the question, because all of the surrounding country was higher than the rock.



Then the engineer in charge of the mine suggested boiling the water out with an electric-light globe. This scheme was tried and worked out successfully. An ordinary 32-cp. incandescent lamp was lowered into the drill hole until it floated on the surface of the water. Half an hour after the current had been turned on, the water began to leave the hole in the form of steam. The lamp was lowered as the water receded, and in eight hours the hole was emptied. The lamp was left burning in the hole, however, for two hours, until every trace of moisture had been eliminated. The blasting operation was then successfully undertaken.

LOOP OF CORD SAVES TEMPER IN PULLING CORKS

Only when a cork breaks, or falls into the bottle, does one think at all of this humble article of commerce. Yet one inventor feels that, other things being equal, consumers will favor the brand of goods which is most conveniently removed from the container. So the cork he advocates is featured by a firmly anchored loop of cord, which permits easy extraction and conserves the cork. As this device permits the use of a much smaller cork, the inventor also claims that its adoption will save money for the manufacturer.



PHONOGRAPH NEEDLE PLAYS BOTH LOUD AND SOFT TONES

A phonograph needle is now produced which will play either loudly or softly without being removed from the socket. If soft music is desired, the needle is inserted with its broad face parallel with the front of the case. If it is later desired to increase the volume of sound, the needle is turned through 90° without interrupting the music.

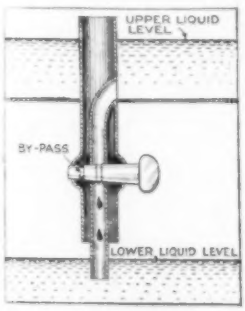
¶ Post-office authorities have announced that registered mail will now be accepted for delivery in both Turkey in Europe and Turkey in Asia.

HUGE PIPE OF WOOD STAVES OVER MILE IN LENGTH

An enormous water pipe, built up of wooden staves to a diameter of 13½ ft., has been laid at Niagara Falls, Ontario, to connect a hydroelectric plant gatehouse and surge-tank penstocks, 6,750 ft. apart. This great tube, constructed with exceeding care because of lack of precedent, rests on supports 4½ ft. apart. The staves are cut from Douglas fir, 6 in. wide and 4 in thick, with faces, inside and out, finished to the curve of the pipe radius, and the edges dressed to exact radial lines. Lengths vary from 12 to 32 ft., with 80 per cent of the total number, however, more than 14 ft. long. Iron tongues, 1½ in. wide and 1/16 in. thick, inserted in saw cuts, hold adjoining ends of staves in line. The tongues, slightly wider than the wood, also grip the sides of neighboring staves. The hoops binding the pipe together are of ⅞-in. mild steel, in two pieces, each with one end threaded to bolt into a shoe on the opposite end. At the penstock end of the pipe the hoops are spaced 2½ in. apart, increasing to 8¾ in. at the forebay end.

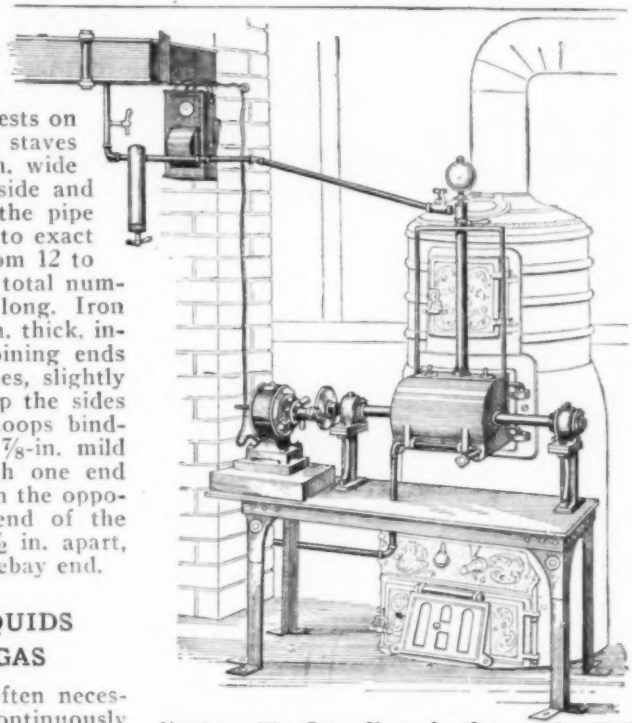
STOPCOCK FOR LIQUIDS HAS BY-PASS FOR GAS

In the chemical arts it is often necessary that drops of liquid fall continuously from one vessel into another through a stopcock. In some cases, as for example in the generation of carbon dioxide, where the lower liquid is a carbonate solution and the upper an acid, pressure of gas may stop the flow. A stopcock devised in an eastern university has two concentric tubes. The outside tube terminates above the surface of the liquid in both vessels, and an annular groove in the key of the stopcock forms a by-pass, always open, for the gas pressure. The inside tube opens through the side of the outer tube below the surface of the upper liquid, and the lower end extends down into the lower liquid. The drops pass through this tube.



SIMPLE OIL-BURNING PLANT REDUCES HEATING EXPENSE

Extreme economy and simplicity are features of an oil-burning furnace recently patented by a Canadian. A fan, driven by an electric motor, vaporizes crude oil by forcing two currents of heated air through a chamber in which the oil drips. The resulting gas, mixed with four parts of air, is ignited by a piece of burning oily waste or rag. A deflector breaks up and distributes the gas flame. It is claimed the furnace will heat a nine-room house for less than one and one-half cents an hour.



Heating a Nine-Room House for One and One-Half Cents an Hour Is a Very Economical Proposition, and the Canadian Inventor of the Oil-Burning Furnace Pictured Here Says It can be Done with His System

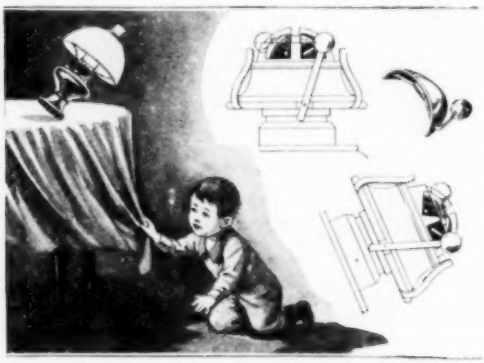
SOUTH AMERICAN TREE SAP SUBSTITUTE FOR MILK

Sap obtained from a tree which grows on the banks of the Magdalena and Opon rivers, in the Department of Santander, Colombia, South America, is a palatable and nutritious substitute for cows' milk, declares a recent report. Known as "perillo" to the inhabitants of the region in which it is produced, the sap is pre-

ferred by many to milk, especially for use in coffee. Condensed and made into cakes, perillo is very popular.

LAMP EXTINGUISHES ITSELF WHEN OVERTHROWN

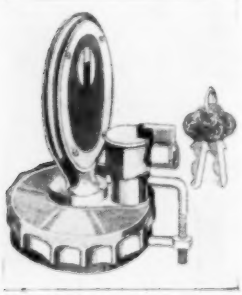
To eliminate the danger of explosion and fire, an inventor has designed a kerosene lamp, or lantern, which is automatically extinguished when tilted or overthrown. The principle is a simple one. On each side of the wick is a wing, or snuffer, which rotates on an axle parallel with the wick. At one end of each axle is attached a lever that holds a small weight. When the lamp is tilted, one of the weights moves through a small arc, throwing a snuffer over the wick and extinguishing the flame.



The Detailed Views at the Right Show How One Wing or Snuffer is Certain to Cover the Wick and Extinguish the Flame When the Lamp is Tilted

RADIATOR-CAP ATTACHMENTS MAY NOW BE LOCKED ON

Now that auto owners are attaching valuable instruments to their radiator caps, means for protecting them from theft is desirable. A California concern is bringing out a small tumbler lock, easily fitted to any radiator cap by drilling a hole in the top. The lock engages one leg of an adjustable U-pin, the other leg of which is inserted in a hole through the side of the cap and filler nipple.

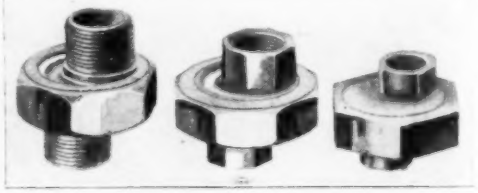


TO USE GERMAN ARTILLERY TO TEST UPPER AIR

Engines of death and destruction will become instruments for the gathering of scientific data, if the idea of a member of the French Astronomical Society becomes a reality. The scientist proposes to use the large-caliber guns captured from the Germans for sounding the higher strata of the atmosphere by shooting into the air projectiles containing apparatus for recording conditions at great altitudes. Investigation of the proposal by a ballistic expert indicates that the best results would be obtained by shooting vertically, using a streamlined projectile. Fired from a 13½-in. gun, such a projectile would travel 77,080 ft. into the air in 69 seconds, and have a velocity of 1,755 ft. per second at the conclusion of its earthward fall. Another projectile of similar shape and weighing 484 lb., would travel 258,136 ft. into the air in 125 seconds if fired from a gun of the type nicknamed "Big Bertha," and while falling would attain a velocity of 1,666 ft. per second. The initial velocity of this projectile would be 5,248 ft. per second.

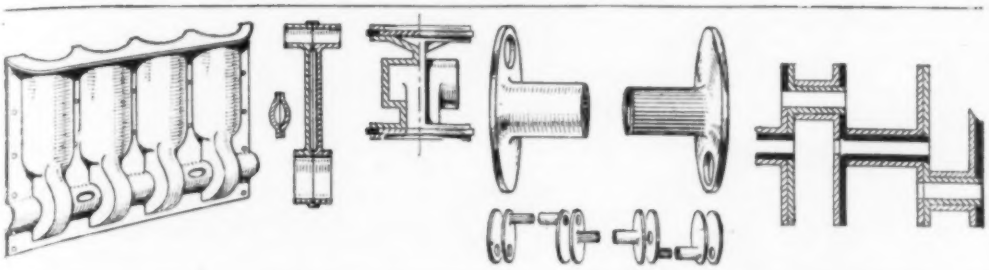
DOUBLE-ECCENTRIC PIPE UNION SOLVES JOINING PROBLEM

To facilitate the joining of two pipes which are out of alinement, a double-eccentric union has been placed on the market. Threaded inlets are placed eccentrically on both sides of the union. These may be adjusted with a wrench to meet the pipe ends perfectly. A concrete insert may be adjusted to receive a pipe end at exactly the right point, even though the insert has not been placed accurately.



Joining Pipes That Are Out of Alinement is Made Easy with This Double-Eccentric Union

¶Two army officers have laid plans for the first aerial boxing match. They will meet in the tonneau of a big bombing plane, while referee and timekeepers sail alongside in another plane.



BY COURTESY OF THE MOTOR CYCLE

Sheet-Steel Stamping for One Half of Four-Cylinder Engine is Shown at Left, Next Coming Longitudinal and Cross Sections of Connecting Rod; View (Partly in Section) of Assembled Piston, and at the Right Five Views, Perspective and Section, of the Method of Building Up the Crankshaft

CASOLINE ENGINES STAMPED OUT OF SHEET STEEL

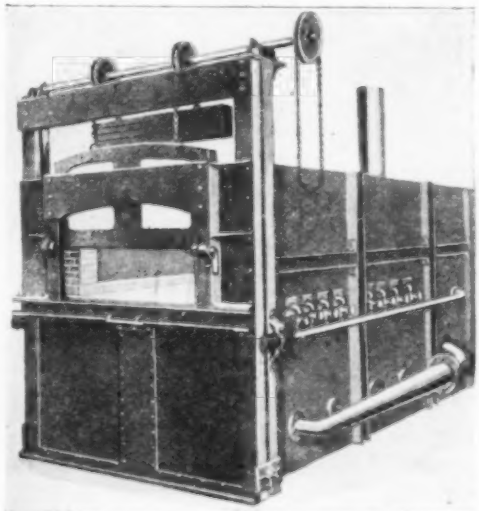
A decided innovation in gasoline-engine construction is revealed by an English inventor, who already has the commercial development of the idea under way. The entire engine is built up of sheet-steel stampings. In a four-cylinder model, two identical stampings form the crank case and cylinder block, the stampings being bolted together. Steel-tube linings, a head stamping with valves in place, and pressed-on water jackets, complete the cylinders. The crankshaft is made of disks with pressed-out portions for hubs and crank pins, the latter telescoping and reinforcing each other from opposite disks. Six stampings are required for the piston, exclusive of rings, and two are needed for each connecting rod. The method is declared to reduce cost and weight, and increase strength and manufacturing facility, especially for quantity production.

MEASURE, STRAINER, FUNNEL COMBINED IN OILCAN

A flexible nozzle, positioned like the spout of a teapot, is the feature of a new graduated container for lubricating oil. A hook at the upper edge holds the nozzle upright, and above the opposite handle is a thumb lever actuating a regulating valve in the bottom. The oil passes through a strainer before issuing from the nozzle, and when the latter is depressed the measure becomes a funnel. A cover is fitted if desired.

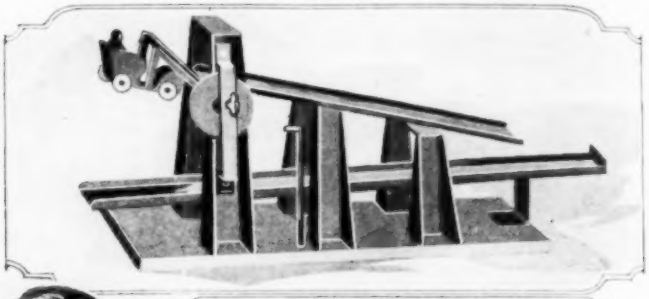
ECONOMICAL GAS FURNACE STORES EXHAUST HEAT

Economy of operation is the feature of a new gas annealing-oven furnace emphasized by the British firm which manufac-



Practically No Heat is Wasted by This Gas Annealing-Oven Furnace, According to the Makers. The Secret Lies in the Two Heat-Storing Chambers underneath the Oven

tures it. It is built with the idea of conserving all the heat resulting from combustion. Two heat-storing chambers are located under the oven proper, and air entering the furnace is directed through these alternately. While air is passing through one storage chamber, the other is being heated by gases escaping from the oven. Gas is fed into a space above the chamber through which air is passing. Figures cited to indicate the efficiency of the furnace show that with a temperature of 2,242° F. in the oven, the temperature of the flue gases was only 181 degrees.

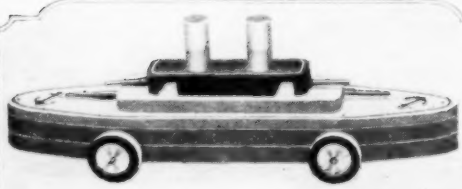


This is Said to Be One of the First Mechanical Toys to Replace the German Products Which Once Crowded the Market. The Little Auto is Kept in Constant Motion down the Inclines by the Revolving Arms

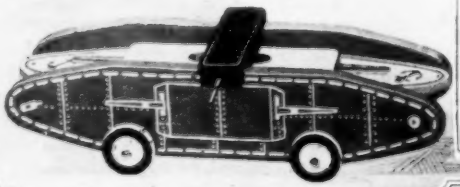
While the Old-Fashioned Hobbyhorse Rocks Tamely in the Nursery, This Impetuous Steed Speeds along the Sidewalk in Real Steeplechase Fashion. The Rider Steers It by Turning the Head, Just as with a Regular Horse. It won't Break under Big Brother's Weight Either, as It is Tested in the Factory under 500 Pounds' Pressure

The Rubber Band Sends This "Monoplane" Dart High above the Treetops. At the Top of Its Flight the Wings Spread Open, and the Little Plane Glides Lazily to Earth. The Picture Shows How It is Shot into the Air, and How It Looks from Above in Its Downward Glide

This Phonograph Record is Clamped to the Holder. So, When the Weighted Arm is Swung, the Needle Travels around the Groove and the Paper Sings the Tune

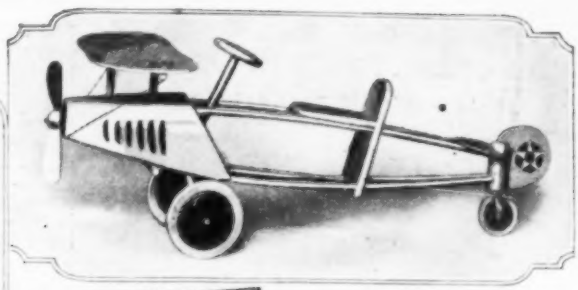


The Very Small Youngster is Delighted with His Own Cleverness Each Time He Transforms His Wooden Battleship into a Fighting Tank. Every Piece must be Used to Make Either of the Toys



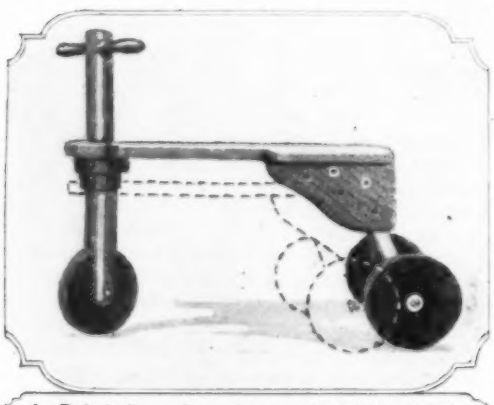
The Two Lower "Decks" of the Dreadnaught at the Left Become the Sides of the Tank; the Cabin is Turned Crosswise to Become the Turret, and the Funnels Hold the Sides Together

Here Is a Simple Wooden Toy Which Quickly Rocks Its Way into Baby's Heart. It Is of Sturdy Construction, with the Seat So Close to the Floor That a Fall Is Not a Serious Matter



This Juvenile Airplane Is So Light That a Small Child can Carry It. Yet It Boasts a Wing Spread of 24 Inches and will Support a 200-Pound Person without Breaking. Two Chubby Legs Furnish the Motive Power

Pressure on the Stirrups Sets This Wooden Pony to Swinging. It is Shown on Its Outdoor Mounting, but It may be Hung from a Doorframe if Desired. For Youngsters of Four Years or Less, the Swing is Made in a Safer, Inclosed Form

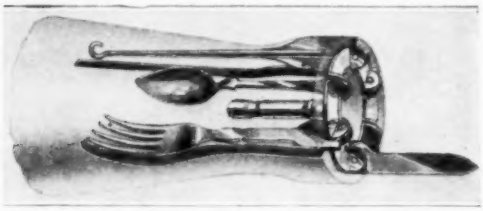


As Baby's Legs Grow Longer This Little Car is Adjusted to His New Requirements. The Tailpiece Slips into Any One of Three Positions, While the Front is Adjusted by Placing the Collars of the Steering Column above or below the Seat

For the Very Small Man of Business This "Truck" will Fill a Long-Felt Want, as the Body Easily Holds Eight Mud Pies or an Equivalent Load. Like the Others on These Pages the Toy is Designed to Withstand the Knocks of the Hardest Play

ARTIFICIAL ARM HAS CUTLERY AND OTHER TOOLS ATTACHED

A whole outfit of useful implements, including knife, fork, and spoon, button-

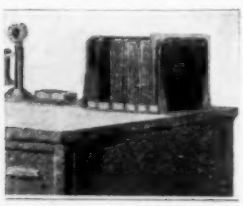


Artificial Arm Carrying All the Implements the User Really Needs, Which Open and Close Like Jackknife Blades

hook, and whatever else the user may desire, is directly attached to an artificial arm patented by an English inventor. The arm ends in a wrist plate, on which the various tools are pivoted. Normally they rest in grooves in the arm, held by a wire spring at the pivots. When extended for use, the same spring prevents unexpected closing.

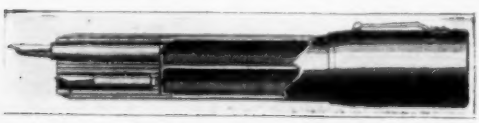
SECTIONAL DESK FILE EASY TO ADJUST

A desk file recently placed on the market consists of adjustable units, each one of these being two plates of sheet steel, facing each other and so fastened together that their relative position may be changed by a simple operation. The size of the file depends upon the number of units and their adjustment. Rubber feet prevent the file from scratching a desk top, while an index adds to the convenience of the device.



DOUBLE-POINT FOUNTAIN PEN WRITES IN TWO COLORS

Draftsmen, bookkeepers, and others who make use of different-colored inks in their work, will be interested in certain improvements recently made in fountain-pen construction, whereby two pen points having a single holder can be used. Independent reservoirs for the inks are provided in twin cylinders within the barrel. The pen point likely to be more used can be permanently extended, while the other may be withdrawn into a recess, so that it will not interfere with the free use of its companion pen.



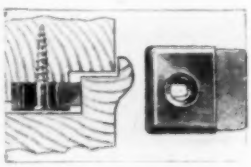
"Double-Barreled" Fountain Pen That Writes in Two Colors of Ink: One of Its Points Slides Back Out of the Way of the Other

AUTO DEVICE STOPS ENGINE WHEN OIL RUNS TOO LOW

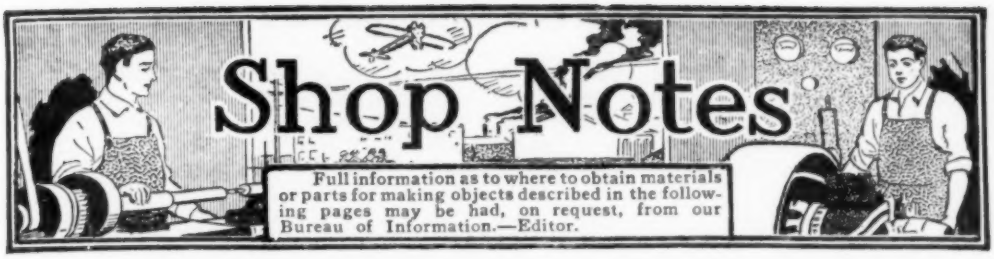
The danger of running an auto engine dry, and damaging it, is overcome by a new device, which screws onto the crank case in place of the lower pet cock. It consists of a float in a small cylinder, with a visible indicating rod projecting from the top, and an electrical contact in the bottom. When the oil is dangerously low, the float grounds the ignition circuit by bringing the contact points together, and the engine comes to an immediate stop.

AUTO DOORS MADE SILENT BY SIMPLE ABSORBER

Improvements are being made now in the very smallest details of the automobile. One of the latest is a device to eliminate noise and jar caused by the slamming of the door of a car. Invented by a northern Illinois man, it consists of a square of rubber and a metal washer of special shape. The rubber is fastened to the edge of the door next to the frame by means of a screw through the washer, and acts as a shock absorber.



¶ The first ship to sail for Europe directly from Chicago with a cargo of meat left the lake port recently for Liverpool, England. Another vessel, similarly laden, cleared for Hamburg, Germany, a short time after the departure of the first.


Shop Notes
Full information as to where to obtain materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

Modern Indoor Lighting at Small Expense

By WILTON G. RICHARDSON

MODERN ideas of indoor lighting require that no open flame or electric filament must be directly visible to the eye. This is the result of a practical appreciation of the fact that a moderate amount of light, properly distributed, enables the human eye to see much better than a much greater quantity of light not properly placed, especially if, in the latter case, a strong light glares into the eye. There is, in fact, a movement to make illegal the use of lights in factories and offices which present to view surfaces that glow too brilliantly, say, those which radiate illumination at a greater rate than 3 cp. per square inch. This would mean that nothing brighter than the open fishtail gas flame should go unshaded, for the ordinary gas mantle has a much greater brilliancy, and the filament of any type of electric light is still brighter. Even this brilliancy of 3 cp. per square inch is to be taken as a maximum, and not as a desirable specification for good lighting.

The ideal method of illumination, with a view to avoid fatigue of the eyes, is conclusively found to be that of "indirect lighting." This means that the source of light must be entirely shut off from the vision, and that all illumination must, therefore, be by light reflected from white or light-colored surfaces. All "bright spots" are thus eliminated from the field of vision, and the eye is relieved from all glare. Particularly in the case of children's eyesight, it is found that providing good illumination, either by the indirect system or by the use of shades between the light and the eye, much relieves the strain, and permits longer periods of reading or studying without eye fatigue.

Since scientific lighting fixtures are rather expensive, it is interesting to see how some of their benefits can be obtained by those who are not in a position to invest large amounts of money in lighting fixtures. The first photograph shows how the combination fixture in the living room of a flat was converted into an indirect-lighting fixture; the picture was taken by the light of the lamps photographed. The arms supporting the electric sockets, which were formerly bent downward at a 45° angle, were bent up to the position shown. As the tubes were of brass, this was easily done with the hands, leaving no tool marks. The frosted-glass shades were replaced with metal reflectors. These had a dark finish on the outside and a polished surface on the inside. Indirect lighting, such as furnished by lamps thus fitted, need not be made strong enough for reading fine

By Bending the Arms Supporting the Electric Sockets of an Ordinary Lighting Fixture, and Substituting Metal Shades, It is Adapted for Indirect Lighting

print, or other exacting work, since to produce indirect lighting of such brilliancy involves the use of a large amount of

current. A rather dim light will be found quite comfortable for ordinary use, and when a stronger light is necessary for some particular purpose, it may be supplied by a table lamp, furnished with a shade which will prevent the filament from ever being directly seen by the eye.

Another interesting specimen of this kind of work is furnished by a California woman who converted her summer parasol into a beautiful floor-lamp shade, as

A Pongee Parasol, Decorated with Some Beads and a Fringe, was Converted into a Shade for a Floor Lamp

illustrated in the above photographs. The cover of the parasol was of a natural pongee design in old rose and blue, with dots and a border stripe of black. Removing the cover from the parasol, she took the frame to a wire worker and had him run a wire around the lower edge, soldering it fast to the ribs. He also put a collar in the top of the frame. Inside it, he crossed two wires, to support a ring in the center which fits down over the little post at the top of the pedestal, upon which the shade rests.

Strips of old-rose silk, 1 in. wide, were used in binding the wires of the frame, the rough edges being turned under. Part of an old evening gown was used for the old-rose lining of the shade; this was tightly stretched over the frame, and was made secure by pinning it to the wrapped wires. The lining of the shade which covered the outside of the frame was stitched to the upper side of the wrapped wire, care being taken to leave no wrinkles in the silk. The pongee parasol cover was then stretched over the old-rose lining, and tacked down in a similar manner.

Before finally stretching the parasol cover into place, a few dozen nail-head beads in different colors and sizes were purchased, and sewed upon the black spots and upon the border of the parasol cover. After the cover had been fastened to the frame, the raw edges were turned back on the outside and stitched in place. A band of silk fringe, in old rose and black, was then sewed to the lower edge of the shade. A beaded galloon, costing 20 cents per yard, was used to outline the ribs of the frame, and also used to conceal the raw edges at the top and bottom of the shade.

The total cost of this ornamental floor lamp was $18.20, made up of items of $2 for the wire frame, $1.60 for the galloon, 60 cents for the beads, $4 for the fringe, and $10 for the base, or pedestal, with full electrical equipment, including a three-light cluster and three tungsten lamps. It would be difficult to purchase a lamp of similar design at retail for twice that amount.

Artificial Ivory from Eggshells

The student of clay modeling can add interest to his work by varying the materials used, and extremely decorative effects may be obtained with imitation ivory. Make a paste by mixing alcohol with equal parts of finely powdered eggshells and isinglass, warming the vessel which contains the mixture by placing it in a jar of hot water. The paste is very easy to work while it is moist, but hardens when it becomes dry, and looks exactly like ivory. If it sets before the design is completed, it can be softened again by adding warm alcohol.—S. Leonard Bastin, Bournemouth, Eng.

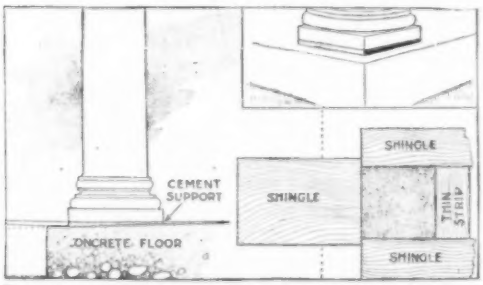
Punching Holes in Auto Lamps

The small oil side lamps still used on many automobiles are apt to be extinguished by road shocks. As the front wheels drop to the road level after passing over a small obstruction, part of the air inside the lamp is forced out at the top, and there is not enough left to nourish the flame. This condition can be corrected by filling the partial vacuum created by the escaping air. Punch two small holes with a nail, just under the door of the lamp, and sufficient air will enter from below to take the place of that which escapes at the top.—Edwin Schubach, Chicago, Ill.

Cement Supports for Porch Columns

Some years ago I built a concrete porch floor in the front of my house, and decided to use columns turned from wood to support the roof. I wished to prevent water from getting under the columns and rotting them, but wished also to find some method which did not produce such an unsightly appearance as do the cast iron sub-bases which are ordinarily sold for the purpose.

Accordingly, I placed the square wooden bases on the porch floor in exactly the positions they were to occupy later. Since the slant of the floor was practically the same as the taper of a shingle, I placed a shingle on either side of every base with the thick ends in line with the front side. Then I selected some wide shingles and fastened one with its thick end touching, for a very short distance, the thick ends of the other two shingles. Next, I fitted a thin strip of wood between these two shingles, at the back side of the base, the thickness of this strip being determined by the thickness of the shingles at this point. When these forms were completed and held in place by weights or other convenient means, the wood bases were carefully lifted out. I then made a rich mixture of cement and sand, and after wetting the floor inside the forms, filled each with cement and leveled the top with the top of the shingles and the thin strip. As soon as the cement had dried slightly, I removed the forms and left it to harden.

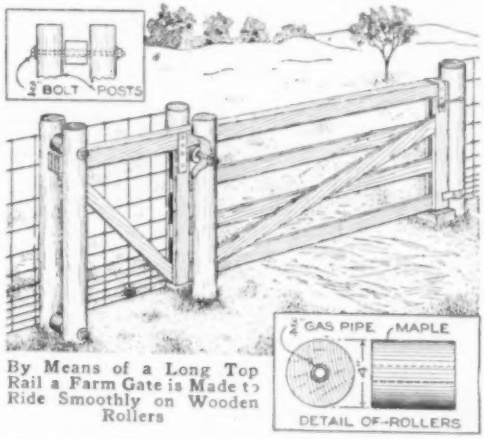


Thin Cement Sub-Bases for Wooden Porch Columns Permit the Water to Flow Out, and Thus Prevent Rotting of the Columns

The next day the columns were erected. They have stood for a long time. The wood shows no signs of decay, though the floor is in a place entirely exposed to the weather. These concrete bases were sufficiently high to prevent water running under the wood; they were cheap, inconspicuous, and durable.—Arthur J. Dunckel, Dolgeville, N. Y.

Farm Gate Moves on Rollers

A sliding farm gate which rides on rollers is easily opened and closed, and such gates would be commoner if it were not for certain difficulties of construction. The gate must be suspended, as the earth is too soft to support the rollers, and



By Means of a Long Top Rail a Farm Gate is Made to Ride Smoothly on Wooden Rollers

if it hangs from a track, barn-door fashion, the passage through the gateway will be obstructed. This difficulty can be overcome by furnishing the gate with a long top rail which projects several feet beyond the rest of the structure, as shown in the sketch. The projecting part bears against a roller placed above it, so that equilibrium is maintained by the principle of the cantilever. There is less strain upon the posts than in the case of a hinged gate, but it is necessary to plant them firmly, as the gate will not ride easily if they are bent from the vertical. Each pair of posts should be bolted together before being set in position, and should be set 3 ft. deep, with a coat of creosote on the lower part, to prevent rotting, and with wooden blocks spiked around them, to keep them steady. The rollers are made of hard wood, bored to hold a bushing of ¾-in. gas pipe, which should be made a tight fit. They are then placed between centers, or on a mandrel, and turned true, after which they should be boiled in linseed oil to make them weatherproof.—H. A. Shearer, Willits, California.

¶ Valuable manuscripts, or other writing, may be preserved and protected by applying collodion with a fine, silky brush. When this is dry, even soaking in water will not blur the writing.

Three Simple Bridges for the Farm

Although thousands of farms are crossed by small streams, good farm bridges are rarely seen. The type most used consists of two or three logs, thrown

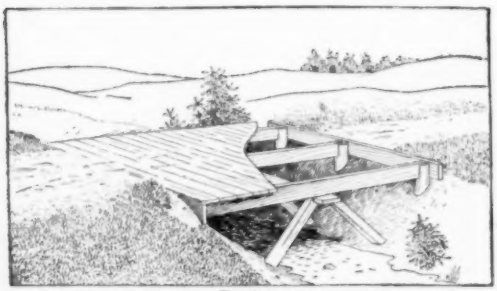


FIG. 1

For Short Spans, a Bridge of Great Simplicity can be Relied on to Support Even a Heavy Tractor

across the stream and covered with planks, which are usually loose. Such bridges cannot be trusted to carry heavy loads, such as tractors and threshing outfits, and require repairing after high water.

The bridge shown in Fig. 1 is very simple, but is very strong when used in short spans of not more than 16 ft. The ends of three 3 by 12-in. planks are set edgewise in short posts or piles, driven into the ground, 5 ft. apart, on the banks of the stream or gully. A 12-ft. length of 3 by 12-in. plank is supported under the centers of these stringers, by posts driven into the banks of the stream so as to form a trestle. Upon this simple but strong framework are nailed 3-in. planks, 12 ft. long. If likely to be swept by high water, the long timbers should be securely spiked to the posts upon which they rest.

Another simple bridge is shown in Fig. 2. The three stringers are 3 by 12-in.

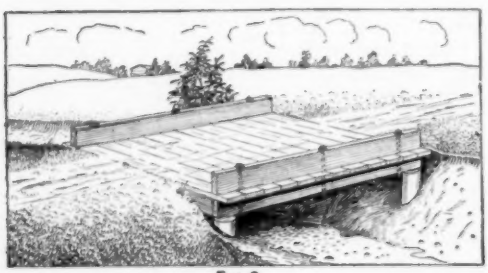


FIG. 2

A Bridge for Short Spans Where It Is Not Convenient to Have Supports in the Middle

planks set edgewise, on piles driven, 5 ft. apart, in the banks of the stream. These stringers are floored with 12-ft. planks. Other 3 by 12-in. planks are then set up edgewise over the two outside stringers, and ¾-in. bolts are put through both stringers and floor. They should be spaced 3 ft. apart, and should have large washers at each end.

The bridge shown in Fig. 3 is more complicated, because it is intended for longer spans. Four piles are set in each bank, spaced 3 ft. apart on centers. The stringers are 3 by 12-in. planks, spliced as shown in the sketch, the splices of the adjacent stringers being placed alternately on either side of the center of the bridge. A 3 by 12-in. plank, 12 ft. long, is bolted to the underside of the stringers, in the center of the bridge, before the 3 by 12-in. by 12-ft. floor planks are spiked on. Two other stringers are bolted on top of the flooring, over the two outer stringers, as in the second bridge described. Then two 8-ft. lengths of plank are spiked upright at the center of the bridge, one on each side. These should

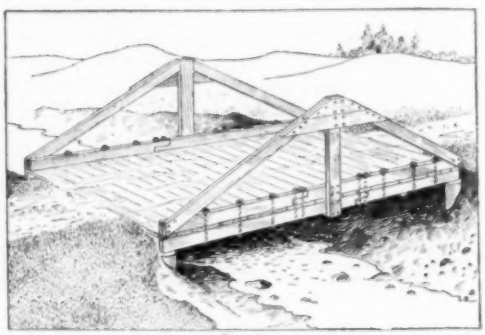


FIG. 3

For Somewhat Longer Spans, a Bridge Reinforced with a Simple Truss will be More Practical

be spiked to both stringers, and spiked very firmly, or bolted, to the timber under the stringers; in fact, it is well to mortise the ends of the horizontal timber into these upright tension members. Other planks are strung from the ends of the bridge to the top of the uprights. Here they are fastened by triangular pieces of plank bolted to the sidepieces, and to the uprights.

These bridges are all made from common sizes of planks, which can be obtained even at small lumber yards. Each bridge is simple to plan and cut, and all three are sufficiently strong for all ordinary needs. The 12-ft. width is enough to permit passage over the bridge of practically every farm implement.—J. Horace Van Nice, Waukon, Ia.

Patching and Prolonging Life of Auto Tops

After being used for two seasons, the rubber-composition top of an automobile is likely to develop holes where creases occur. To close each opening, and prevent water from dripping through, cut a circular patch of canvas, coat one side with tire cement, and also coat the inside of the top around the hole. Let the cement dry for a few minutes, and then coat both the top and the patch again liberally. Leave them for 10 or 15 minutes, after which place the patch in position, and hold a heated flatiron over it, thereby curing the cement and making it hold. The cracking and peeling of the rubber is caused by exposure to rain and sunshine. After the first year, the composition looks dry and rusty, and the threads which hold it together begin to break; but the top will last three times as long if it is rubbed with body wax four or five times a year. Do not use liquid polish, but paste, as this has more body and affords more protection, being remarkably effective in shedding water, so that the fabric under the rubber does not decay.

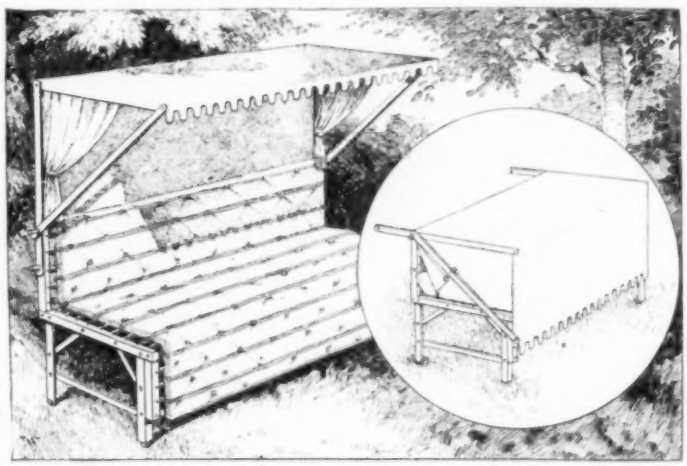
When the windows in the side and rear curtains begin to look yellow with age, a cloth dipped in vinegar will clean the celluloid, thereby improving the appearance of the windows and affording clearer vision to the driver of the car.—George A. Luers, Washington, D. C.

Oats for Stretching Shoes

Tight shoes mean sore feet, especially in the army. A method of stretching shoes, which probably originated on the farm, was used to good purpose at the front. Its advantage lies in the fact that no tool is necessary. Soak a quantity of oats in hot water for a few minutes, fill the tight shoe with the wet grain, and let it stand overnight. In the morning the grain will have swelled sufficiently to expand the leather and make the shoe comfortable.—Harry R. Schultz, Ames, Ia.

Combination Outdoor Couch Bed and Shaded Lawn Seat

An old spring couch rendered good service to its owner long after it had become too shabby to be kept in a parlor. He placed it out of doors, and used it throughout the summer as a garden seat in the daytime, and as a bed at night. He made a cover of canvas supported by strips of thin iron, and attached it to the back of the couch by means of bolts which acted as hinges, so that it could be raised and lowered. In this way the couch was completely curtained at night, and protected by an awning from the sun in the daytime. In the latter case, the cover was raised and kept rigid by means of pins, which passed through the upright members of the couch frame and also through two of the strips on which the canvas was spread. These two strips were then in a vertical position, and formed extensions of the uprights of the couch; but at night, when the couch was entirely curtained, they were lowered to a horizontal position, so that the portion of the canvas which they supported formed a canopy, or roof, with curtains on all sides to hide the couch completely from observation. During the day the curtains at the two ends were unnecessary, and were therefore folded back and fastened with tape to the upright portions of the cover frame.



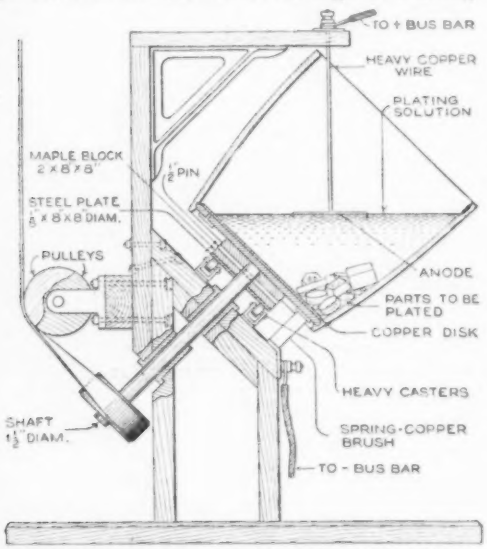
A Spring Couch Does Duty in the Daytime as a Garden Seat, and at Night as a Protected Outdoor Bed

¶ Plugged-up sink or drain pipes may be cleaned by pouring gasoline into the opening.

A Rotating Electroplating Tank for Small Parts

By KENNETH M. COGGESHALL

NOT only is it difficult to electroplate small bolts, nuts, screws, washers, springs, and the like, in a still tank, but the finish is apt to be rough. Where large quantities of small parts are to be plated, stringing them on wires preparatory to the process is a long and tedious job. A simpler method of doing the plating is to utilize a rotating tank, so devised that the parts constantly roll over one another, and yet are in electrical contact with the negative power circuit. This rolling action of the small parts insures an even plate, with the added advantage of buffing



The Rotating Tank, Working Somewhat Like a Tumbling Barrel, Provides a Method of Depositing Metal Evenly on a Large Number of Small Parts

and polishing. Hundreds of pieces can be plated at one time in this manner. Such a rotating electroplating tank is by no means difficult to construct, and no special tools or equipment are required for constructing it.

For the tank, secure a heavy watertight barrel. Cut it in half along its large circumference. On the half reserved for use, make certain that all the hoop bands are secured firmly in place. From a sheet of copper, about 1/16 in. thick, cut a disk whose diameter is less than that of the barrel head. This disk is then secured with screws to the inside of the barrel bottom. In like manner, a brass or copper ring, 2 in. wide and 1/8 in. thick, is cut with an outside diameter slightly less than the copper disk. This ring is fastened to the outside of the barrel bottom and is connected electrically by a heavy copper wire to the inside disk. When the tank is in operation a brush rubs against this collector ring, and thus the pieces being plated, lying, as they are, in contact with the copper disk, are connected electrically through the disk, collector ring, and brush to the negative power circuit, or bus bar. The brush is made from several copper strips, 2 in. wide, and is secured to the supporting framework in such a position that it will bear against the collector ring.

The driving shaft is made from an iron bar, 1½ in. in diameter and 21½ in. long. A block of hard wood, such as maple, is screwed to the bottom of the tank inside the collector ring. At the true center of the barrel head is drilled a 1½-in. hole, through the block but not through the head. The shaft end is driven into this hole, and a hole is drilled through the side of the block and into the shaft; a short piece of rod, driven through the block, will hold the shaft from turning in the block. A steel plate of suitable size is secured, and a 1½-in. hole is drilled in its center. Four screw holes should also be drilled and countersunk, at points equally spaced from each other near the circumference. This plate is attached to the wooden block by four flat-head iron screws. Care must be used in putting this plate in position, since it will serve as the backing plate for the simple roller bearings.

The framework, or standard, for supporting the barrel should be as rigid as possible; a general design is suggested in the sketch. Arrangements are made so the axis of the barrel lies at an angle of 45° with the horizontal. Four heavy furniture casters are fastened to the framework in such manner that they will roll against the steel plate as the barrel revolves, thus forming a simple roller bearing to take up the weight of the plating tank. Two bearings of antifriction metal should also be provided, to take up the lateral thrust due to belt drive, as well as to center the plate over the casters.

A crown-face pulley is placed on the free end of the shaft, and two similar pulleys are placed in the position shown. The driving belt will be held on the shaft pulley through the aid of the other two pulleys. A light scaffold is constructed to support the anode, as indicated in the

sketch. This anode, which may be a heavy plate of copper, nickel, or zinc, depending upon the type of plating to be done, is suspended from a heavy copper wire which is fastened to the scaffold and connected electrically to the positive side of the power circuit. The anode is immersed in the electrolyte, and during plating the current passes from it through the solution to the small parts on which the plate is deposited. When the plating operation is completed, the parts are pulled over the edge of the barrel into some retainer, with the aid of a small instrument, like a toy hoe.

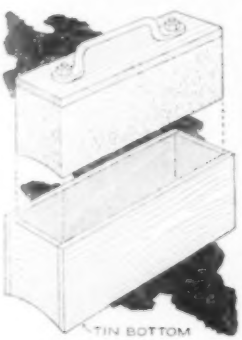
The same precautions should be observed in plating by this method as in the still-tank process. Current regulation and solutions will be the same as usual. The only noticeable difference due to the rotating-tank method will be that quicker and better results will be obtained.

Nail Used as File Cleaner

A handy file cleaner can be made by flattening the point of a large nail on an anvil, or other hard surface, and filing the end square. A few strokes across the file will cut a row of teeth which will dig down into the grooves and remove all dirt. Such a tool is far more effective than a brush in a woodworking plant, where files tend to gather a good deal of pitch.—Frank A. Rice, Ouray, Colo.

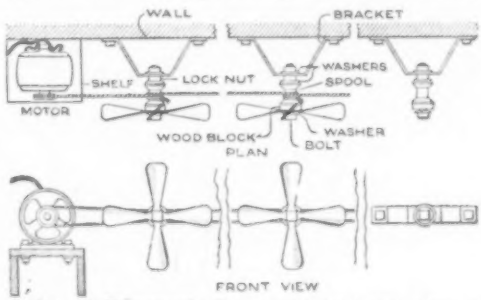
Sand Block Polishes Commutators

A piece of sandpaper fastened flat on a wooden block is not as effective in smoothing the surface of a commutator as a curved block made for the purpose out of cement and sand. Make a box from ¾-in. boards, giving the required curve to the lower edge of the end pieces, and nail a sheet of tin to the bottom, after bending it to the same curvature. This box serves as the mold, or form, to give the required shape to the block. To make the mixture, use six parts of clean, sharp sand to one part of Portland cement, and add a tablespoonful of sugar to every pound of cement. Mix thoroughly with water until the paste is loose enough to take the shape of the mold readily, and then put on the lid and leave the material to dry. When it is solid, remove the sides and bottom of the box, and drill two holes through the lid into the cement to take expansion bolts, which will be used in securing the handle. The result will be a sand block that will last indefinitely. —James E. Noble, Kingston, Ont., Can.



Motor Drives a Row of Fans

To avoid the expense of installing motor-equipped fans, the keeper of a public hall attached a row of large spools to a wall by means of brackets, and fastened fan blades to each spool. All the fans were connected with a small motor by a long string, which passed around each spool in turn, operating like a machine belt. A high rate of speed was not attained, but there was sufficient to cool the hall, and the air was circulated freely enough to insure complete ventilation.—W. Wallace Snyder, Bedford, N. Y.



A Set of Homemade Fans is Distributed along a Wall, and Belted to a Motor by a Long String

Engagement Reminder for Desk

Without constant reference to memoranda, engagements are likely to be forgotten. A doubled sheet of paper with one leaf at an angle, as shown, will not be overlooked.

Nuts that have dropped into awkward places in automobiles may be removed by greasing the end of a stick and fishing for them with this implement.

Ladder Hooks and Boxes for Painters and Fruit Pickers

When working on a ladder, it is desirable to have both hands free, and so an adjustable bracket which will hold a load

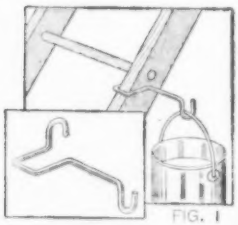


FIG. 1

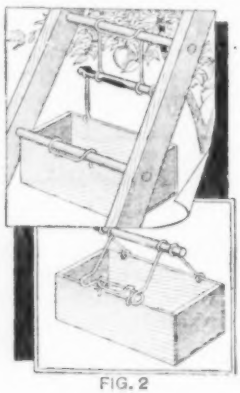
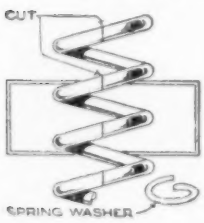


FIG. 2

Wire Supports Used for Hanging Paint Pots, Baskets, and Other Articles, on Ladders, can be Contrived in Such a Way That They do Not Interfere with a Workman's Hands

at any elevation on the ladder is very convenient. Coarse wire is the best material to use, and the pattern of the contrivance is determined by the nature of the work to be done. Fig. 1 shows a very simple pattern, which is serviceable for both fruit picking and painting. It is much handier than the double hook so often used to hang a paint pot in the center of a ladder rung, as it keeps the pot clear of the ladder and out of the workman's way. The construction shown in Fig. 2 is not so simple, but far more adaptable. It is best suited to fruit picking, and the wires are so arranged that they do not interfere with the picker's hand as he loads his basket or box. When it is full, he detaches it from the ladder, and by a slight readjustment of the wires he is provided with a handle to carry it away.

Using Broken Valve Springs



Do not throw away the broken spring of an automobile valve. Cut it into sections, so that each complete turn forms a unit; file the ends smooth, and use the pieces for spring washers.

A water barrel cut in two makes two good washtubs. Two opposite staves furnish the handles of each tub by being allowed to project above the others.

Conserving Batteries of Stationary Gas Engines

A mechanic who used a four-cycle stationary engine regulated its speed by means of a governor, which operated by holding the exhaust valve open and preventing the engine from sucking in a charge. When this took place the spark was wasted, and as he wished to avoid draining energy from his battery unnecessarily, he contrived a contact adjustment by which the circuit was kept open except when the exhaust valve was closed. He mounted an insulated strip of brass on the rod which operated the exhaust valve, and connected it with the battery. He mounted another strip on the cylinder, and adjusted it so that it made contact with the strip on the rod when the exhaust valve was closed. The strips were connected to the ignition circuit, which thus remained open even when contact was made at the timer, and was closed only when a charge of gas was ready for firing.—Arthur A. Richardson, Centre Barnstead, N. H.

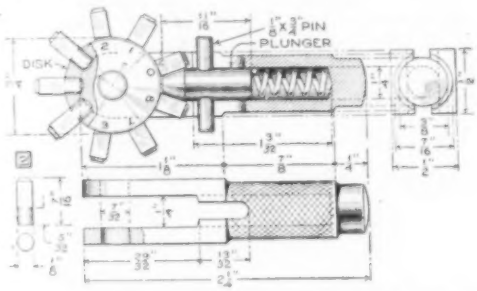
Homemade Steel-Stamp Mounting

The metal stamps which are frequently used to mark numbers on tools and machine parts are apt to be mislaid, and this is a strong argument against using a set of separate stamps for the different numbers. Experience has shown that it is a much better plan to make an instrument with all the stamps attached, so that it can be handled like one of the adjustable rubber stamps with which dates are printed. The illustration shows the dimensions to be followed in making a handy tool for this purpose, but no allowance is given for loose or tight fits, as clearances are easily provided with a reamer or file. Any kind of steel can be used, but, of course, tool steel is best.

Make the handle first, of square stock, turning it to a cylindrical shape where indicated, and knurl it, so that it can be firmly gripped in the hand. Cut a slot in the square end, and at the bottom of the slot drill a hole extending nearly to the other end of the handle. At the top of the hole, slot the metal again, in such a way that the second slot forms a continuation of the first, but is narrower; then drill a hole through the square end, piercing the jaws on both sides of the wide slot, so as to hold a pin, for a bearing. Cut a steel disk to revolve on the pin, and drill a hole through the center

to hold it. Ream after drilling, so that the pin will be a loose fit in this hole when assembled, and a drive fit in the holes already made in the jaws of the handle. Divide the circumference of the disk into nine equal parts, make prick-punch locations for the holes which are to hold the different stamps, and use the stamps to mark numbers on the side of the disk against the nine locations, so that they may be easily identified. Ten will not be necessary, as 6 and 9 will be marked by the same stamp.

Then determine the size of the holes in the circumference of the disk. From the stamps cut off the portions that are to be used, and bevel the ends which will enter the holes. Also bevel the end of one of the discarded portions, and, to avoid experimenting with the stamps, use it to determine the size of the holes needed to make a force fit. The experiment should be made by drilling holes of different sizes in a piece of scrap steel, and a few trials will show what diameter will give a drive fit without violent hammering. Having determined the size of the drill, make the holes at the locations prick-punched on the circumference of the disk, and drive in the stamps, using a piece of wood or brass to protect the figures on the faces.



A Piece of Bar Stock and a Revolving Disk Form an Instrument for Stamping Any Number Desired on Tools and Machine Parts

A plunger must be furnished to keep the disk from turning after the stamp has been set, and this will be dropped into the hole drilled through the length of the handle. Bevel the end which is to fit between the stamps projecting radially from the disk, and be careful to make the fit a fairly snug one, so that the disk will not oscillate when the tool is in use. A coil spring is placed below the plunger at the bottom of the hole, to hold it rigidly against the disk, and, when the latter is to be shifted, the plunger is pressed back by means of a short pin which passes through it.

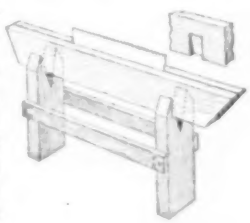
A glance at the drawing will show the order in which the parts are to be assembled and, if reasonable care has been exercised in filing and reaming the parts where the adjustments call for accuracy, there will be no appreciable lost motion while the tool is in service.—C. Ray Haynes, Centre Village, N. Y.

A Vegetable Sprinkler

For keeping vegetables fresh, some small stores use a device consisting of a vertical pipe connected with the water main, and surrounded by two or three circular dishes of galvanized iron, all of which except the lowest one have several holes punched in them. The dishes are covered by conical pieces of coarse wire netting, upon which the vegetables are laid. The water escapes from a jet at the top, strikes a cap or baffle plate placed over it, and is thereby broken into a fine spray. This falls upon the vegetables below, and eventually passes into the bottom dish, where it escapes through a waste pipe. The dishes are secured to the pipe by iron clamps.

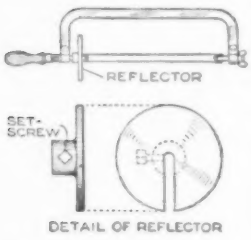
Saw Clamp Made from Sticks

A carpenter went to work on a job without his saw clamp, and in the course of his work he had occasion to use it. To avoid a trip, he made one out of some scraps of lumber. Two boards were planed smooth to serve as jaws, and after the saw had been placed between them, they were dropped into V-shaped cuts which had been made in two 2 by 4-in. pieces, set upright. Tapered grooves were cut in the jaws where they entered the V-shaped cuts, so that they were gripped tightly together by being forced downward. The angle of the V-cuts should not be more than 20° or 25°. —Willis E. Berg, Flagstaff, Ariz.



Mirror on Hacksaw Blade

A small nickelplated disk, placed on the blade of a hacksaw in the manner shown, will act as a reflector and throw light on the material along the edge of the blade. In this way it will greatly assist the operator if he is working in a dark place and has no helper to hold a light. Even with an assistant, it is often more of a hindrance than a help to have a portable lamp held near the operator's eyes; but a reflector of this kind takes up practically no space, and throws all the light on the work without dazzling the workman.

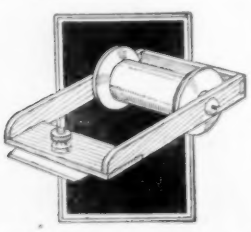


Painting the Stairs

A staircase coated with fresh paint is out of commission unless a narrow track is left unpainted at one side or in the center, to be covered later when the rest of the paint is dry. But when a surface has been coated piecemeal in this fashion, it has an uneven look, and a better method is to paint alternate steps, using the unpainted ones for ascending the staircase, and coating them later when the painted ones are dry. As each step is painted, coat the riser belonging to the next step, so that fresh paint will not be injured if a riser is accidentally kicked in using the stairway.—J. H. Moore, Toronto, Can.

Razor-Honing Frame

A very serviceable frame for holding double-edged safety-razor blades while honing them, can be made in a short time out of pieces of a cigar box, an empty spool, and some glue, plus a screw and thumb nut from an old dry battery. The spool is placed in the frame so as to revolve freely, its position being determined by the angle desired between the blade and the hone. The blade is placed below the crosspiece at the front, and the screw is passed through both from below, whereupon the thumb nut is put on and tightened. Then, to sharpen the blade, roll the holder back and forth over the hone. When one edge is sharp, loosen the nut and turn the other edge to the front. In this way both edges are sharpened on one side, and to sharpen them on the other side the blade is turned over. It is, of course, necessary to pivot the spool in such a position that the angle between the blade and the surface of the hone will allow sufficient clearance for the head of the screw; if there is not quite enough room, the head can be filed down.—Albert E. Jones, East Milton, Mass.

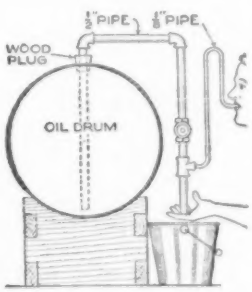


Green Food for Poultry Kept in Wire Sling

Green poultry feed gets dirty if thrown on the floor of the poultry house, and is only partly consumed. The hens will eat it all if it is kept in a pouch, or pocket, hung by a cord from the roof of the house, or fastened to the wall like a manger. The best material to use is 2-in. mesh poultry wire, which will hold any waste vegetables and weeds, and will enable the birds to get at the feed from beneath without letting them spill any of it. Hang it in such a position that the hens will be able to reach it without straining or jumping.—J. T. Bartlett, Ft. Collins, Colorado.

Starting a Tank Siphon

It is not uncommon to apply the principle of the siphon in drawing gasoline from a tank into a pail, but an objection to starting the flow by sucking the end of an ordinary hose is the disagreeable experience of getting the taste of the gasoline. To avoid this, set the tank on blocks, so that the bottom is above the top of the pail, and use a metal tube for the siphon. Make a tee joint in the tube, a short distance above the lower end, and attach a smaller pipe to the joint. Placing the finger over the lower outlet, the air is sucked from the siphon until the flow has been started, and a valve shuts off the stream when pails are being exchanged.—J. C. Smith, Kodiak, Alaska.



Retracing Badly Creased Blueprints

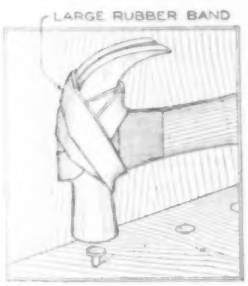
It is difficult to trace a blueprint that is prevented by folds or wrinkles from lying flat. To straighten such a print, soak it in water, hang it up by one corner, and allow it to dry. Do not hang it against a wall, but from a line, so that air will have access to it on all sides. Use no mechanical means of drying it.

Thimble for Acetylene Work

An acetylene welder suffered constantly from burns on one finger of his left hand, where the sparks fell most copiously from his torch, and his glove gave little protection, as the material on this finger was generally burned through. A thimble was rolled out of scrap sheet copper, with the metal turned over at one end to form the top, where a small hole was left for ventilation, and a guard projected down the back to protect the knuckle. The seam was soldered at the side, so that the falling sparks might not drop directly on the seam, and melt the solder.—E. B. Van Vliet, Paterson, N. J.

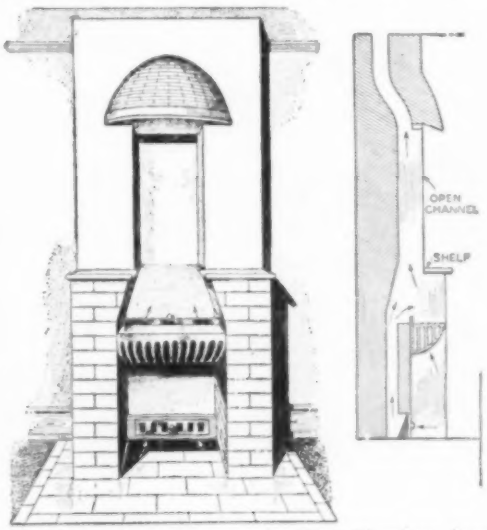
Rubber on Hammer Protects Woodwork

A soft bumper, or fender, on the head of a hammer will insure the safety of adjacent wainscoting, when nails are being driven into a floor close to the wall. Wind a large rubber band around the hammer head, giving it several turns about the metal, so that it will act as a cushion, protecting finished surfaces from being scratched or dented by misdirected blows. The material is not heavy enough to affect the balance of the hammer.—Chas. H. Willey, Concord, N. H.



Unusual Type of Fireplace

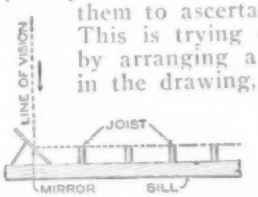
It is not usual to build an open-fire grate 30 in. above the floor for the purpose of warming a living room in a farmhouse. This method of construction has, however, been found very successful on a farm in one of the southern states, distributing the heat thoroughly without permitting the smoke to cause any trouble. An open channel carries the smoke up to a cowl which covers the entrance to the flue, about 4 ft. above the fireplace. It is kept traveling upward by means of a continuous draft which rises out of an air passage, running from a grating at the floor level up to the back of the grate, where it ends in the open channel. The constantly moving air causes the coal to be thoroughly consumed, and the height of the fireplace enables the heat to radiate in all directions. The latter feature gives this type of grate an advantage over the usual kind, which often expends too much heat on the hearth itself, without allowing much to reach the floor level in the middle of the room.—W. B. Gray, Louisville, Ky.



An Air Duct at the Back of a High Fireplace Acts as a Blower, and Also Keeps the Smoke Moving through an Open Flue

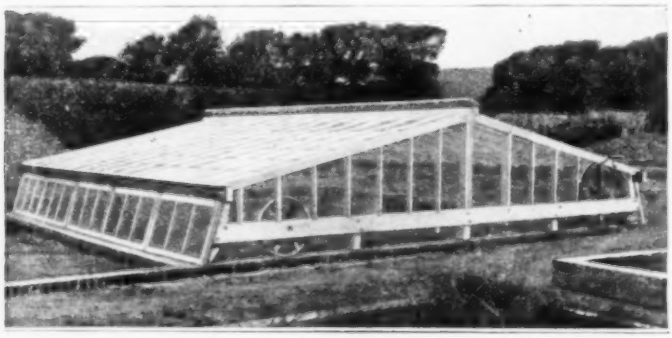
A Mirror to Sight Levels

When laying sills or joists it is frequently found desirable to sight along them to ascertain the exact level. This is trying on the knees, but by arranging a mirror as shown in the drawing, an accurate sight may be taken while standing up. The mirror must be plane, or the image will be distorted and an accurate sight cannot be taken. A small plate-glass toilet mirror with easel back, procurable for a few cents, is excellent for this purpose, and will save much inconvenience.—Roy B. Snow, Ontario, Can.



Greenhouse Moved About on Wheels Has Wider Usefulness

A traveling glasshouse is a great convenience to the nurseryman or market gardener. Many crops require shelter only at certain periods of the year, such as in the early stages of their growth, or when they are coming to maturity. But if the plants are in the ground under a fixed structure, the shelter cannot be used for anything else until the crop is cleared, whereas a glasshouse on wheels can be taken from plot to plot, whenever needed. The side panes are hingd at the eaves, so that they can be lifted up whenever it is necessary to move the house over tall crops. It will be observed that the wheels run on ways made of bricks, but even without a track of any kind there is no difficulty in handling the structure. One greenhouse of this kind will serve a very large garden, as it is usual to plant crops which mature at different periods.



A Movable Greenhouse Enables a Truck Gardener to Economize in Glass, and to Give Shelter to Different Crops in Turn, at the Period in Which They Need It

Salt Shaker Is Converted into Toothpick Holder

Some restaurant patrons regard the open toothpick holder with misgivings. Different classes of people use it, and when toothpicks stand in the same container for a long time, their chance of remaining clean is considerably reduced. A salt shaker with a metal screw top of the usual pattern can be used as a closed toothpick container. Cut a disk of rubber or cork, about ¼ in. thick, and of sufficient diameter to make a tight fit in the neck of the bottle. Force it into position with the metal top over it, and screw the latter down tight. Bore two ⅛-in. holes through both cap and stopper; then remove both, and countersink the holes on the lower side of the stopper. Fill the shaker with toothpicks, and replace both stopper and cap, taking care that the holes in both correspond. The container is now complete. When it is turned upside down, the countersink at each hole will guide a toothpick into the mouth of the hole, so that only two of them can escape at once, and the rest will be kept clean until they are to be used. Also, if the container is knocked over, none of them will be soiled; but, if the picks in an open container are spilled on the floor, it is not likely that any witness of the accident would want to use any of them.

Restoring Indistinct Graduations on Fever Thermometers

The ink in the graduations on a clinical thermometer is gradually worn away if the instrument is in constant use. It can be renewed by dipping a piece of cloth in ink and rubbing it along the graduations, care being taken to wipe off all surplus ink with paper before it has time to dry. Paper is used because it is too stiff to sink into the depressions at each graduation, and consequently the ink in these remains undisturbed. Ordinary writing ink gives fairly good results, but the waterproof ink used by draftsmen is blacker, and therefore better.—Harold E. Benson, Boulder, Colo.

Roost Windows in Poultry Houses Aid City Breeders

The city poultry breeder generally finds a problem in the limited space of his poultry house, but he can add to the area by using roost windows. They should be long and narrow, and placed in the wall below the dropping boards, preferably close to the sill. One or two windows will usually be enough. As the hens scratch, they often pile up litter below the dropping boards, so that the space under them is wasted; but it is saved if roost windows are used, as hens always scratch with their heads toward the light, and they consequently pile up the litter behind them.

Fitting Flues When Cut Too Short

On a job of refluing a boiler, the flues were cut too short. A few of the new flues were inserted at random in their corresponding holes in the two flue sheets. They were fastened at one end. An iron rod, almost the size of the inside diameter of the flues, was heated white-hot, and inserted in one of the tubes. By repeating the treatment the flue expanded and increased in length. The flue thus lengthened was quickly rolled. This plan was followed on several other flues. Upon cooling, the flues shrank, drawing the flue sheets together, and decreasing the distance between the flue sheets from ⅛ to ¾ in. Then the job was ready for inserting the remainder of the flues, proceeding according to the usual practice.

Motorcycle Garage in a Box

Motorcyclists will be interested in the garaging idea illustrated by the accompanying photographs. This simple box was built at a cost of about $8 by a motorcycle enthusiast who is over 75 years old. It was made from crate-end boards, obtained for the asking at the agency where the machine was purchased, and the principal items of its cost were the tar paper with which it was covered and the hardware entering into its construction.

By this method the motorcycle is housed in a minimum of storage space. Even in the most congested communities there are few motorcyclists who would find their living quarters so cramped for space that a motorcycle garage of this type could not be built. It furthermore gets the owner away from the not uncommon difficulty involved in keeping his machine in a shed or garage often several city blocks away from his residence.

The box is of such stanch construction that it could not be readily broken open. The two doors, end and top, make it very accessible when putting the machine away or removing it. The shelves along the sides are used for oils, greases, spare parts, and tools. All of these may be easily reached, and at the same time are equally well housed when the box is closed.

A track is laid along the floor of the box, into which the wheels of the machine fit. These enable the owner to run the machine either in or out of the box with only the end door open, the track serving as a guide to the front wheel and handlebars, so that it keeps to the center automatically. The top of the box is latched from the inside and the end door is secured with a padlock.

There are, of course, many features of construction which can be varied according to the needs or the convenience of the maker. Instead of crate boards, piano boxes may provide material for the purpose, and very little change is necessary. Two boxes are used, the back of each being removed, and they are then fastened back to back, with those portions facing outward which are ordinarily used to cover the front or keyboard side of the instrument. A door is placed at the end, and the arrangement of the interior fittings may be identical with those already described.

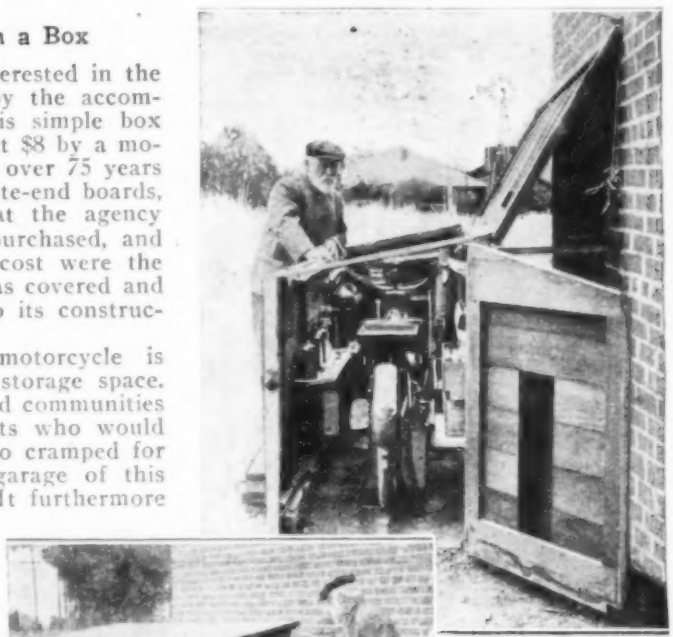


PHOTO BY COURTESY OF J. E. JONES

This Simple Motorcycle Garage Houses the Machine in a Minimum of Space, and Saves the Owner Many Journeys to and from a Public Garage. It Is Weatherproof, and Provides Sufficient Protection from Theft. Tools and Lubricating Oils are Kept on the Shelves along the Sides

Old Tanks Protect Water Plug

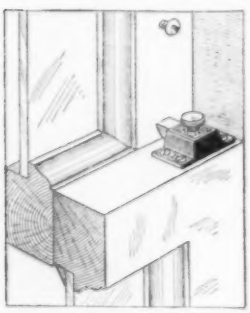
A water plug standing at a sharp corner is sometimes in danger of being damaged by rapidly driven vehicles. The photograph shows a provision made to

Two Old Tanks, Set One on Either Side of a Water Plug at a Sharp Bend in a Road, Prevent the Plug from being Struck by Carelessly Driven Trucks

safeguard the plug. Galvanized-iron tanks from a kitchen range were filled with sand to make them stand firm, and were then placed on each side of the plug, so as to meet the impact of any truck or wagon which came too close.—Monroe Woolley, San Francisco, Calif.

Safety Catch for a Window

To make a very simple safety catch for preventing the raising of a window from the outside, a cabinet-door catch is screwed across one end of the top of the lower sash, so that it will just clear the edge of the upper sash. A screw is inserted in the corresponding upright of the upper sash, at a distance which will allow the sash to be raised to a height not sufficient to admit a man's body. When the sash is raised to this height, it comes in contact with the screw. To raise the window to its full height, it is only necessary to pull back the catch so that it will slide over the screw. The upper sash cannot be pulled down from outside without automatically closing the lower one.



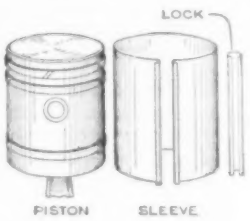
¶Motorists parking at the curb in city streets can find out the position of cars behind them by looking at the reflections in store windows, and so avoid collisions.

Plumb Bob Hung from Tapeline

A mechanic who constantly used a long plumb line in his work, and found that he was often obliged to disentangle the line, attached the plumb bob instead to the end of a tape measure, which he rolled up in its case when not in use. The tape, although stiffer than the ordinary line, gave sufficient accuracy for the work.—A. M. Fairfield, St. Mary's, Kansas.

Tin Sleeve for Replacing Piston Rings

There is little difficulty in fitting a piston carrying several rings into the cylinder, if a tin sleeve is used to compress the rings in their grooves as the piston enters the cylinder. When the rings have been placed in position, the sleeve is folded around the piston and locked with a strip of tin, after which the piston is forced into the cylinder entrance, the sleeve, of course, remaining outside. In this way each ring is kept from spreading until it has begun to enter the cylinder.



A less elaborate method, which is almost as effective, is to form the sleeve from a tin can, without bending the edges as shown, and then compress sleeve and rings by wrapping a piece of stiff wire around it and twisting the ends together with pliers. This method has the advantage of not requiring a different sleeve for every different size of piston, but the disadvantage of being a trifle more cumbersome.

Salvaging Rusted Tools

A rusted tool is permanently impaired, for although it can be salvaged, it is more liable to rust again than one which has been kept in condition. To remove rust from a steel object, fasten it tightly with wire to a piece of zinc, and place them in a container holding water, to which a little sulphuric acid has been added. It is a good plan to use a large container, so as to treat several objects at once, and they should remain there until the rust has entirely disappeared, which may take some days, or even a week. When

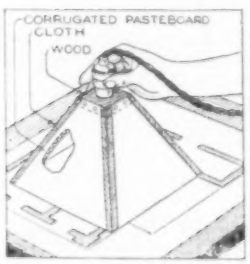
articles are badly rusted, add more sulphuric acid occasionally. The steel being in contact with the zinc, short-circuited battery cells are formed, and the rust is reduced to iron again by electro-chemical action. The steel becomes darkened, or blackened, by the process, but resumes its original color when rubbed with sweet oil or a mixture of petrolatum and kerosene.

To Avoid Breaking Gauge Glasses

In cleaning a steam-engine water-gauge glass, it is important to avoid touching it with metal. Experience has shown that contact with a metallic surface may weaken the material so that, although it does not break immediately, it is likely to be found broken after a short time. For this reason it is advisable not to use wire in pushing a piece of waste through the gauge, but to use a thin piece of wood; also, in cutting new glass to the desired length, to insert the cutter from the end that will not be used. The reverse method was tried as an experiment with several lengths of tubing, and, although no breakage was observable at the time, all the lengths were found broken a short time later.

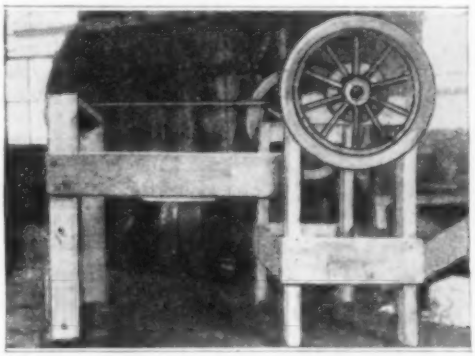
To Dry Drawing Ink Quickly

A lamp shade with a carbon lamp in it will quickly dry India ink if set over a drawing, but an even better arrangement is to make a shade out of corrugated pasteboard, such as large cartons are sometimes made of. The air contained between the corrugations and the two sides acts as an insulation which retains the heat of the lamp. The shade should be about a foot square at the bottom, and is easily glued together, as shown in the sketch. It can be hung on a hook under the table when not in use. Care should be used not to set it over triangles or other celluloid instruments, as they will warp if heated. The device will save a great deal of time in any drafting room, especially in cold, damp weather when the ink is naturally slow to dry.—R. L. Ogden, Denver, Colo.



Portable Bench to Hold Auto Rear Axles

The portable bench here shown was made for use in a repair garage, and was found very useful in overhauling rear



A Movable Frame is Used in a Repair Shop to Support a Rear-Axle Assembly, While Doing Work upon It

axles. The axle housing was disconnected from the frame of the car without disassembling the wheels or the drive shaft, the latter being uncoupled at the forward universal joint. The axle was then laid upon two of the three upper horizontal members of the wooden frame, while the third supported the drive shaft. The housing was prevented from shifting by semicircular grooves cut in the two supporting members. The lower horizontal pieces were ⅞-in. boards, 6 in. wide, and all the other pieces 2 by 4 in., the different members being fastened together with lag screws. The bench stood 30 in. high when completed, and was mounted on casters, so that it could be wheeled to any part of the shop desired, while a tool box, which hung across the frame, removed the necessity of frequent trips to lockers and stock cupboards. The tool box was formed by nailing a board between the two longest of the horizontal members, so that it formed the bottom of a cradle, or trough. Two other boards formed the sides, but only the bottom one is visible in the photograph.—L. B. Robbins, Harwich, Mass.

Holding Bolt with Screwdriver

It is not always easy to reach the head of a bolt with a wrench so as to keep it from turning when a nut is being screwed on, although a screwdriver can be used. Slot the end of the bolt with a hacksaw, and hold it with the screwdriver while using the wrench on the nut.

A Walking Ladder

Though originally constructed for cleaning railroad cars, the "walking ladder" here shown has been found very useful in calcimining walls, and in doing many other jobs which make it necessary for the workman to travel

The Advantages of a Pair of Stilts and a Stepladder are Combined in the "Walking Ladder," on Which a Workman Travels Back and Forth without Descending to the Ground

along a distance at a fixed height above the ground. It is really a pair of stilts developed into a sort of stepladder, with a pair of flat steps, or treads, nailed against two of the rungs at the height at which the workman stands. The steps are furnished with leather pockets, by means of which the workman moves the ladder about, and hollow spaces are made at the top on both sides, as shown in the detail, so that he can bestride the ladder easily.—C. A. R., Pittsburgh, Pa.

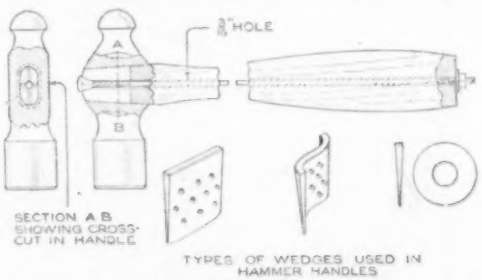
Cutting Out Wall-Paper Borders

Wall-paper borders having curved or irregular outlines, which must be cut out by the paper hanger, require considerable time if this is done with the scissors. A quicker way of doing the work is to use a piece of wire screen, laid out flat on the paper hanger's long board. Lay the border on the screen wire; then, using an awl, darning needle, ice pick, or any such sharp instrument, trace along the outline where the paper is to be cut. The result will be a line of perforations on which the paper can be readily torn. While the outline will be a trifle rough, this will not be noticed at the distance from which it will be seen. Care should be used not to press hard enough on the pointed instrument to tear the screen wire. The easiest way to tear the paper after perforating is to cut the border into 6 or 8-ft. lengths, cover these with paste, fold in the usual way, and tear while the paper is wet with paste; there will then be less danger of tearing it wrong.

Hammer-Handle Wedges

A number of different styles of hammer-handle wedges are illustrated in the drawing. The small views show some very simple types which have proven effective; one of these is merely a large iron washer ground thin on one edge. In the absence of any better method, such a washer is capable of holding a hammer head securely on the handle for a long time. A wedge for more permanent use is shown to the left of the washer. Such a wedge is forged from a piece of ⅛ by 1-in. soft steel. Before cutting it off from the bar, it is held in the vise while a round-nose chisel is used to cut teeth in it like those of a wood rasp. The wedge may be used flat, or may be bent into an S-shape, which gives somewhat better effect, but involves some additional work.

The large view shows a rather peculiar method which has been successfully used. With a long bit, a 7/16-in. hole is made clear through the handle from end to end. A piece of steel wire, slightly smaller than the hole, is heated at one end and upset to a conical shape. In the end of the handle which fits inside the hammer head, the center hole is countersunk to take the wedge formed on the wire. Slots



Various Methods are Illustrated of Preventing a Hammer Head from Flying Off When the Wood of the Handle Shrinks

are then made in the wood, at right angles to each other, and the handle is ready to be set into the head. The wedge is pulled into the wood, expanding all four forks

of it, by a nut screwed onto the other end, which should be threaded for this purpose. The nut can be set into the back end of the handle, but it will be somewhat more accessible for tightening if left projecting, as shown, and will seldom cause any inconvenience. While the hole through the handle unquestionably weakens it somewhat, the wire adds an element of strength, and the wedge has the advantage that when the wood shrinks it can be tightened and held fast.

Mousetrap Used as Bill File

Most mousetraps can be converted into bill files, and the simpler the construction of the trap, the less material there is to remove. Take off the trigger and leave the catch permanently closed, to act as a paper clip. Remove the bait holder and any other unnecessary part, screwing a small eye into the end farthest from the clip, so that the file may be hung up in any position desired.

Handy Forms of Soldering Coppers for Wiring

A mechanic in an electrical repair shop uses, in connection with his work, several types of soldering iron which are useful in doing intricate jobs. One copper, about 1 lb. in weight, has a "V" cut through the side. For making end-to-end splices in stranded wiring, the wires are twisted and then laid in the V-trough of the hot copper, the flux and solder are applied, and the joint is formed by rotating the wire into a strong splice. Another copper, weighing 1½ lb., has a cavity in one side made by a large drill. This is used for soldering twisted ends of wires into a shape suitable for holding in a terminal post. The wire ends, coated with flux, are dipped into the melted solder in the cavity, and are thus joined together with great strength.

Fig. 1

In Shops Where a Great Deal of Soldering of Electric Wires is to be Done, Time may be Saved by Hollowing Out Two Heavy Coppers to the Shape Indicated

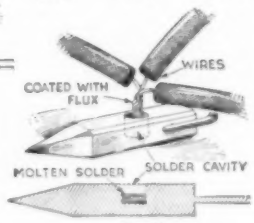
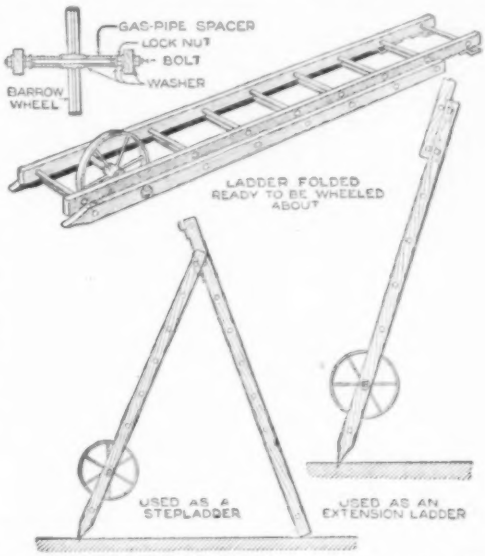


Fig. 2

Handy Combination Ladder

Where storage space is valuable, it is bad management to keep three varieties of the same article, if it is possible to get along with one; but whether on the farm or in a private residence, there are occasions when ladders of different kinds are needed. A long ladder is of little use indoors, and a short one is often useless out of doors because of its limited range; there are also occasions when a stepladder is indispensable. All these cases are taken care of by the ladder shown in the illustration, and most of the details of its construction appear in the top left-hand corner. It is so easy to make that any amateur can adapt the method to the conditions under which he wishes to use it.—A. B. Nutting, Boston, Mass.



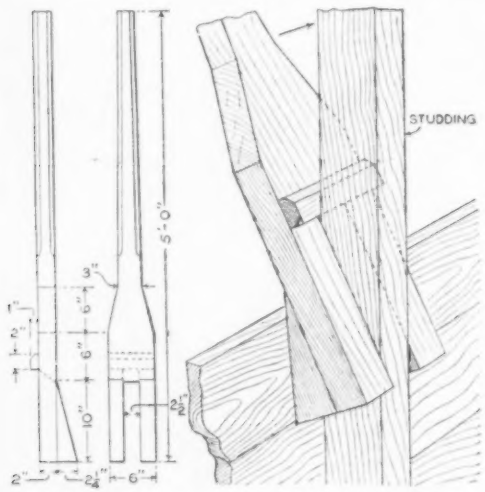
Little Storage Room is Needed for This Adaptable Ladder Which can be Used for Low or High Elevations, and, When Necessary, as a Stepladder

Book Supports Made from Bricks

To make a row of books stand upright on a table or desk, it is usually necessary to have a bookstand of some kind, or to place a weight at each end of the row. To use as weights, coat two bricks with glue, and cover them with felt, or, if the desk is an elaborately made piece of furniture, plush or velvet will harmonize better with its appearance. The weights can then be laid on polished surfaces without harming the finish.—A. C. Lattner, Urbana, Ill.

Forked Crowbar Pulls Up Flooring

The drawing shows a pry bar which is very useful for removing roof boards, siding, and sheathing, or taking up flooring. The advantage is not only in the time



With a Tool Made from a Plank and a Few Blocks Flooring, Siding, or Sheathing is Readily Loosened from the Joists or Studding

saved, but in preserving the lumber without splitting. To make the tool, an ordinary plank is used; a slot is cut in one end, and the bottom of it is beveled as indicated. Two wedge-shaped blocks are nailed on the upper side of the fork ends, and a small block of hard wood is nailed on the underside, just behind the slot, as a fulcrum. The other end of the plank is dressed down to a convenient shape for use as a handle. The tool can be made in a very short time.—Jas. B. Clay, Jr., St. Clair Flats, Mich.

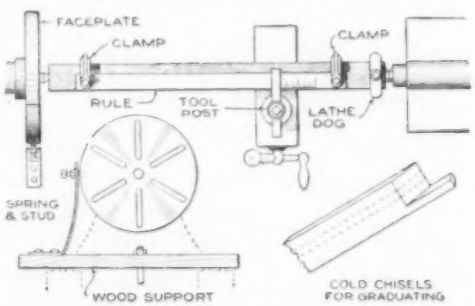
Straightening Casehardened Steel

It is a mistake to use force in straightening a bent piece of casehardened steel, as there is some danger of cracking it. Instead, heat it slightly, place it in a vise, and where it is most noticeably out of line, drop water on the outer surface of the curvature. The material will contract along this surface, so that the piece will become straighter, although reheating may be necessary before it is completely straight. If pieces of wood are placed between the metal and the jaws of the vise, the steel will have greater freedom in returning to its original shape.—Dale R. Van Horn, Lincoln, Neb.

Graduating a Rule on a Lathe

Occasionally a rule is required with special graduations, as thirds, fifths, sevenths of an inch, etc., with multiples of these "odd" divisions. Sometimes a machine is made that requires a divided scale attached to it, or perhaps the mechanic would like to make a rule just for the satisfaction of having one "homemade." Whatever the reason for making the rule, if one possesses a screw-cutting lathe, the graduating is very easily accomplished in the following way.

Secure a rather heavy iron bar, about 1¼ in. square and 30 in. long; center and countersink it for the lathe centers. Put a lathe dog on one end of the bar, and mount between centers with the dog at the tailstock end of lathe. Fasten the tail of the dog to the tailstock firmly, so the bar will not move when the lathe spindle is revolved. Clamp the material from which the ruler is to be made on the top surface of the square bar, flush with the edge nearest the tool post of the lathe. It must be clamped firmly so as not to move while the graduating is being done. The material should be several inches longer than the rule is to be, and the ends carefully finished off to the end marks after graduating. The small bar held in the tool post should just clear the surface of the rule. It is used only as a guide, against which the cold chisels



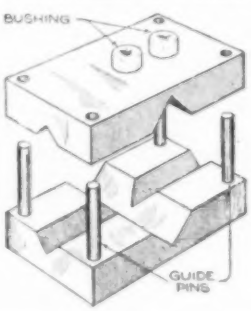
The Common Screw-Cutting Lathe can be Made to Give Service as a Dividing Engine, for Graduating Scales

are held when marking the graduations; it should be exactly at right angles to the rule. Below, to the left, is shown a stop to hold the faceplate and spindle at the same position every revolution. To the right is represented the style of cold chisels used, which are made in different widths, as suggested by the dotted lines. From three to five widths are required to give the different lengths of lines on ordinary steel scales.

To operate, assemble as shown, set the gears to cut, for instance, a 32-pitch right-hand thread, throw in the threading nut, and when the carriage has moved up to the proper place, hold the widest chisel firmly against the right-hand side of the piece of steel in the tool post, with the projection against the edge of the rule, and strike it a light blow with a hammer. Pull the spring away from the faceplate until the stud is disengaged from the slot, and revolve the spindle one revolution, when the stud will snap into place again. The next graduation mark is then made, but this time with a narrow chisel. Proceed with other graduations, using the proper chisels to get lines of the correct length, and endeavoring to make the force of each hammer blow proportional to the width of the chisel. The setting described will give a graduation of thirty-seconds. A 27-pitch thread setting will give a graduation in twenty-sevenths, or if the lathe is revolved three times between each "cut" a graduation of ninths will be secured. Similarly, a 28-pitch setting can be used to mark sevenths, fourteenths, or twenty-eighths.—Harry G. Fesenfeld, Black Earth, Wis.

Drill Jig for Round Stock

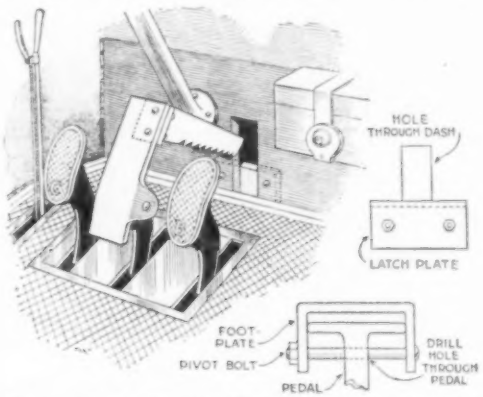
In any machine shop, toolroom, or experimental room, it is often necessary to drill a hole, or a number of holes, at right angles through the axis of round rods or cylindrical parts. The fixture illustrated in the accompanying drawing was designed to simplify this operation, and at the same time assure a hole drilled accurately through the axis of the piece.



The fixture consists of two rectangular blocks having a 90°-groove milled through their adjoining faces, or better, two grooves milled to different depths, in order to accommodate a wider range of work. The guide pins are a press fit in the lower block, but slide freely in the upper one. A set of removable hardened bushings are used, each for a certain size of drill. This is a simple fixture to make, and has more than saved its cost in the shop where the writer saw it.—Henry B. Graves, Jr., Rochester, N. Y.

Low-Speed Latch for Auto Pedal

In using a car with planetary transmission, it was found wearisome to keep the low-speed pedal down by foot pressure when driving uphill or traveling through sand or mud. The pedal was therefore equipped with a piece of ¼-in. sheet steel, with ears, or flanges, on both sides, by means of which it was pivoted on a small pin fitted through a hole drilled in the pedal just below the pad. A long piece of ¼-in. sheet steel, with a number of



By Means of a Toothed Plate the Low-Speed Pedal of an Automobile is Held Down without Pressure from the Driver's Foot

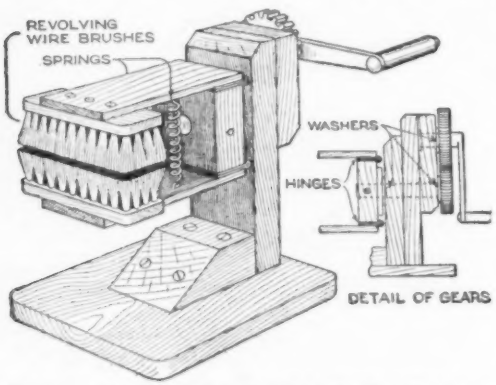
teeth at the end which engage a steel lip screwed to the car dash, was fitted to the back of this member. The saw-tooth edge engaged the lip, ratchet-fashion, regardless of the wear on the lining of the band which the low-speed pedal tightens around the drum in the transmission.

To engage the teeth, the driver pushes the pedal forward until the car is on low speed, and then, with an upward movement of the knee, he causes the teeth to engage. To release the pedal, the pressure is applied on the portion of the plate just below the pivot, so that the teeth rise and disengage. When driving under ordinary conditions, the driver's foot prevents the teeth from dropping to the level of the lip, and if he wishes to travel on low speed for a few minutes, he presses the pedal forward in the usual way; but whenever he finds it necessary to travel for a considerable distance on low speed, the teeth are allowed to fall, thus engaging the lip.

¶ The asphaltum paint used on stovepipes is an excellent substitute for the preparations usually applied to automobile engines for renewing the finish.

A Wire-Brush Potato Peeler

A stiff wire-bristle brush will remove the skin from a potato so quickly and with so little waste that it is practical to apply this method of peeling in the construction of a mechanical potato peeler. Two wire brushes are mounted on a revolving head, which is driven by a geared



Time and Food are Both Saved by Peeling Potatoes with Wire Brushes, Which are Operated by Simple Machinery

handle, the gears being adjusted in such a ratio that the brushes revolve faster than the handle. The potato is held between the brushes at the center, and, as they revolve, it is surrounded by a swiftly turning ring of bristles. It is evident, therefore, that only the central portion of the brushes does any work, and for this reason it is possible to economize by using only one brush, and to cut it in halves, so that one half may be used below and one above. When the machine is in operation, a fork is thrust into the end of a potato, so as to hold it between the revolving brushes while they remove all the skin except at the two ends. Then, to remove the skin on the ends, the potato is again placed between the brushes with the fork thrust into the side. The peeler should, of course, be secured to a table by a clamp, or attached permanently with screws.—C. M. VanAvery, New York, New York.

Watch Used as Protractor

As there are 15 minutes in a quarter of an hour and 90° in a right angle, the minute marks on the circumference of a watch dial are 6° apart. A watch can therefore be used as an emergency protractor, on jobs where great accuracy is not necessary.

Cheap Dinner Bell for the Farm

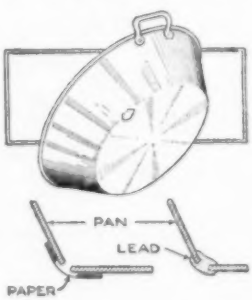
Hang a steel plowshare by a wire so that it can vibrate freely, and strike it with a bolt or other piece of metal. The sound produced is penetrating enough to be distinctly audible half a mile away—a fact which has occasionally restored discarded plowshares and moldboards to usefulness as dinner bells. A chilled-iron plowshare can also do duty as a bell, but the sound is not nearly so distinct as when steel is used.—H. S. Norris, Sebastopol, Calif.

Chimney Cleaned by Firing Gun

If a deposit of soot prevents a chimney from drawing properly, the obstruction can be easily removed by disconnecting the stovepipe and firing a blank cartridge up through the hole. The force of the expanding gases dislodges the soot, which at once pours down the chimney. To prevent it from soiling furniture, the hole should be covered with a board immediately after the explosion. When all the soot has collected at the foot of the chimney, remove it with a fire shovel or large spoon.—Mrs. Edwin J. Bachman, Fullerton, Pa.

Repairing Leaks in Enameled-Iron Vessels

The sketch shows how an enameled-iron pan, which had a large hole in the bottom, was repaired. Small circular holes can be readily filled by inserting a small piece of lead and riveting this carefully. This being a large hole of irregular shape, it was necessary to proceed in a different way. On the outside of the pan were glued several thicknesses of paper, with a hole cut out in the center of each, a little larger than the hole in the pan. Then a piece of paper, without the hole, was glued over this, thus forming a mold for the lead, which was poured from the inside of the pan. Enough lead should be applied to form a head on the inside similar to that formed on the outside by aid of the paper mold.—A. J. Viken, Waterloo, Ia.



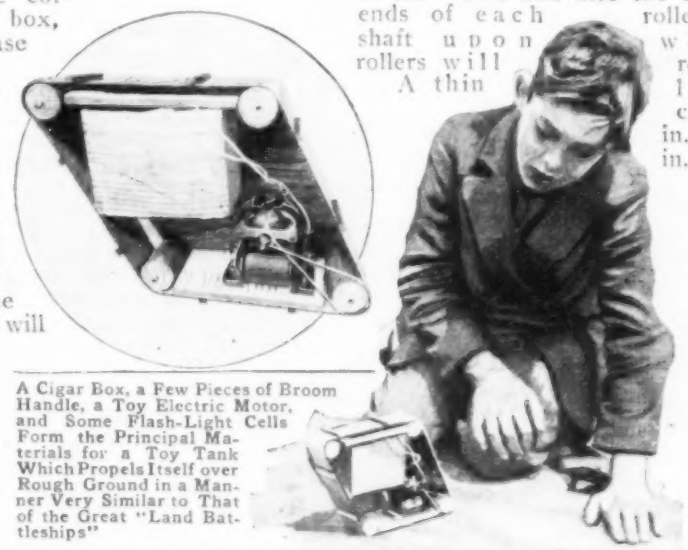
Amateur Mechanics
Full information as to where to obtain materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Toy Fighting Tank

By B. F. ENTLER

ANY lad can readily construct this toy tank, and will get endless fun from watching it crawl over rough ground, climb over obstructions placed in its way, push itself through brush and twigs, or span tiny trenches in its path.

The ordinary cigar box is about 8 by 6 by 2 in., and a box that is well constructed should be selected. With a saw, cut off two opposite corners of the box, in each case removing a triangular corner, 2½ by 5 in. in size. This will begin to show the tank's shape. Probably the cover of the cigar box will need three or four extra nails to hold it in place securely while sawing out the corners.



A Cigar Box, a Few Pieces of Broom Handle, a Toy Electric Motor, and Some Flash-Light Cells Form the Principal Materials for a Toy Tank Which Propels Itself over Rough Ground in a Manner Very Similar to That of the Great "Land Battleships"

Cut from a piece of round wooden stock, about 1 in. in diameter, four rollers, each 2 in. long. A broom handle will serve nicely for this purpose, or an old curtain pole will do just as well. The purpose of these rollers is to fit on a shaft in each corner of the frame of the tank, to act as pulleys over which the belt will pass. To make room for the rollers, it will be necessary to remove from the frame the ends of the box that have not already been sawed away. Also cut away 1 in. of the top and bottom of the frame where the rollers will be. This will allow the rollers to fit in beyond the ends, on a level with the outer edges, just right to carry the belt. The photograph in the circle shows the position of the rollers.

When the frame has been cut, one side of it should be removed in order to place the machinery inside. The photographs show this side still removed, in order that the machinery may be seen. Two small finishing nails, driven through the corners of the frame and into the center of the ends of each roller, form the shaft upon which the rollers will revolve.

A thin leather or canvas belt, 2 in. wide by 25 in. long, is fitted over the four rollers. In order to keep the belt from slipping, the surfaces of the rollers may be well rubbed with resin. The outer surface of the belt is provided with a number of treads, glued in place, in order to give friction enough so that when the power is applied, the tank will be carried over the ground, or even up a slope, if the motor is powerful enough.

A small electric motor, about 3 in. high, is screwed to the lower right-hand corner of the frame, its position being 2 in. to the right of the center of the base, in order to give plenty of room for the battery. The belt pulley of the motor is connected with the nearest roller, using a small cord or piece of fishline for the belt.

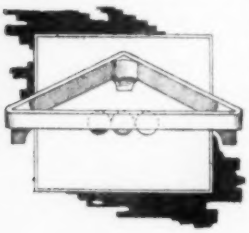
The battery to furnish the electricity

is held in the box secured to the upper part of the tank's frame. The battery box is made from thin wood, like the material in the cigar box, and is 3 by 2 by 2 in. Small screws hold it in place. The battery consists of several tubular flashlight cells, with connecting wires soldered on, or held in contact by wire springs. A switch should be located somewhere in the frame, convenient to turn on the current.

When the mechanism has been located in the frame, nail on the side that was removed. This side helps hold the rollers in place like the other side. When the current is turned on, the motor drives the rollers, and these cause the revolving belt to move the tank over the ground.

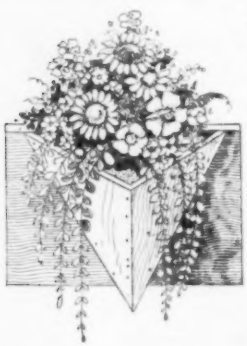
Elevating the Pool-Ball Rack

The ordinary triangular racks used for arranging the pool balls in position to start the game have to be made somewhat loose, and some dexterity is required in lifting the rack so as not to disturb any of the balls. The illustration shows a rack in which the corner blocks have been lengthened, so as to hold the rack at a distance above the table equal to one-half the diameter of the balls. Only the lower edge of the rack then comes in contact with the balls, and the rack can be made a considerably tighter fit, at the same time eliminating almost all the likelihood of moving the balls when withdrawing the rack.—M. E. Duggan, Kenosha, Wis.



Flower Pockets on Fence

A wall pocket to hold a plant can be easily made out of the corner of an old box. It consists of three triangular pieces—two for the sides and one for the back. The sides are, of course, cut from the box without being separated from each other. Several of them nailed to a fence, and each filled with a growing plant, present a very pleasing appearance, and as four pockets may be made from each box there is no trouble in matching them. In cutting the box, the saw should be held at an angle of not more than thirty degrees to the vertical.—Mrs. Grace E. Willey, Concord, N. H.



Ink Impressions of Leaves

An alternative to pressing leaves, flowers, and ferns in a specimen book is to make impressions of them on white paper, with black ink. Lay the leaf flat on white paper, and spray the edges with the ink, by means of an ordinary atomizer, holding this near the paper when working at the outline of the subject, and drawing it to a distance when making the outer part of the background. In this way a sharp, black contour is obtained, with the dense shadow fading into a vignette effect at the outside.—Dale R. Van Horn, Lincoln, Neb.

To Keep Shoe Polish Soft

When shoe-polishing paste is half melted it is much easier to apply, as there are no solid lumps to break up, and the substance is quickly spread in a thin layer over the leather surface. To keep the paste in this condition, so that it may be used at any moment, place it on the valve wheel of a steam radiator. Here it will not be in the way, yet can be conveniently reached when needed.—Harold E. Benson, Boulder, Colo.

Bottomless Pocket for Fountain Pen

A shirt pocket which is too shallow to carry a fountain pen in an upright position can still be used for that purpose, if a small horizontal slit is made near the bottom of the pocket in one corner. The slit should be about half an inch long, and the edges should be stitched or hemmed, to prevent the material from raveling. The top of the pen is fastened to the rim of the pocket with a clip, in the usual way, and the lower end protrudes through the hole. If the pocket is to contain other articles beside the pen, it should be stitched vertically, to separate the pen compartment from the remainder of the pocket, so that objects will not fall through the hole made for the pen.—Thomas D. Baker, Butte, Mont.

Inflating Small Balloon with Hydrogen

A toy balloon will rise if filled with hydrogen, which can be made by combining zinc and sulphuric acid. Place a few pieces of zinc in a strong glass bottle and pour into it a mixture of sulphuric acid and water, containing about five parts of water to one of acid. (In making this mixture, pour the acid into the water; never the water into the acid.) Through the cork of the bottle pass a glass tube, and tie the empty balloon to the upper end with thread. Then make the cork tight in the neck of the bottle and the pressure of the gas generated by the zinc dissolving in the acid will cause the balloon to swell When it is full, tie the opening with thread above the glass tube, and release the balloon.—B. R. Corse, Irvington, N. J.

Garden Seat Mounted on Stump

As the picture shows, a very presentable garden seat can be built from the seat of a discarded buggy. The upholstery is to be ripped off, all projecting nails and tacks are most carefully removed, and such iron members as were part of the seat in its better days are again securely screwed in place. The bottom will be the weak part for garden use. Reinforce this with 1-in. or even 2-in. lumber, if such planks can be found. Fit the bottom in carefully, and let it take the place of the discarded cushion.

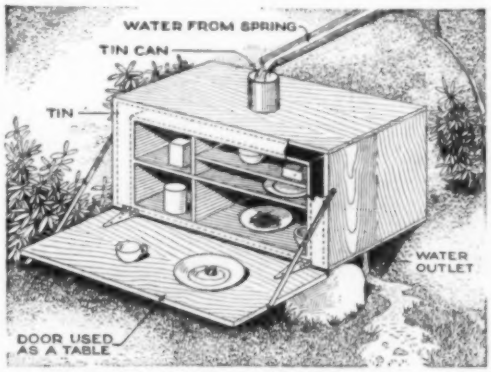
The Seat from an Old Buggy was Mounted on a Stump and Made to Give Service as a Garden Seat

In the illustration the seat is shown mounted on a stump, though it would be easy to provide it with legs; the ingenuity of the builder will suggest the most practical way for his own needs.—C. L. Meller, Fargo, N. D.

¶Sand scars may be removed from soft castings by dropping the casting while still hot into cold water. The resulting steam will ordinarily cause the scar to blow itself out.

Simple Camp Refrigerator Using Spring Water

A group of campers kept their food cool while on vacation, without going to the trouble of carrying a refrigerator with their outfit. They made a cooler out of two wooden boxes which carried part of their supplies, one of them being small enough to fit inside the other, with a space of 2 or 3 in. between. A tin coating made the smaller box water-tight, and, after it had been placed in position, the



Two Boxes are Used at a Summer Camp to Make a Water-Jacketed Food Cooler

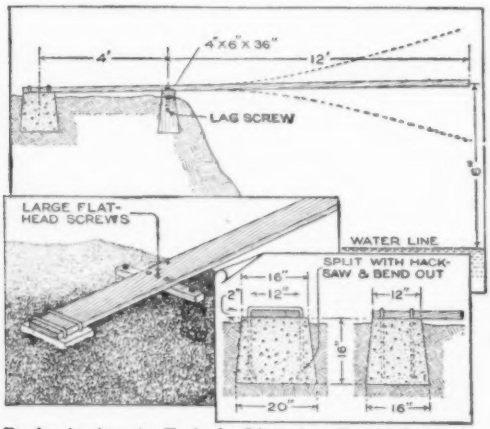
space between both boxes just inside the lid was covered with sheets of tin nailed to the edges, as shown in the sketch. In this way the inner box was completely jacketed, so that running water from a neighboring spring could act as a cooling agent, being conveyed along a grooved pole to a hole in the outer box, where a tin can served as a funnel. Both the top and bottom of the can were removed, so that fresh air, cooled by the water, could be kept circulating freely between the boxes. Shelves inside the smaller box kept the articles of food separate, and the hinged lid of the outer box served as a table or sideboard. The cooler rested on stones, about 4 in. from the ground, and the water escaped through holes bored in the larger box. Iron or lead pipe could be used to convey the water; the pole was used merely on account of its being lighter and easier to carry.

To Preserve Polish of Nickel

The banana oil that is mixed with powder to make bronze or aluminum finish can be used separately to protect nickelplated surfaces from rust. It does not dull the brilliancy of the plating, and is impervious to damp.

Spring Board for the Swimming Pool

A river or lake with natural facilities for safe diving is not always easy to find. When artificial additions are made, it is practical to render them permanent, if the same location is continually visited. A spring board made according to the



By Anchoring the End of a Plank to a Bed of Concrete, a Spring Board is Made a Permanent Fixture

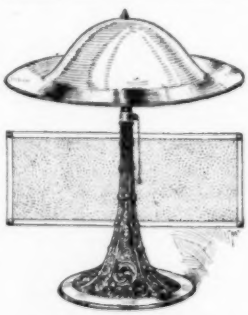
dimensions given in the sketch has been used for over four years, and shows every sign of lasting indefinitely. The shoreward end of it is held by staples or anchors, sunk in a concrete bed, which was made by mixing sand with a quarter of a bag of cement. The staples were cut from ⅜-in. round iron stock, being made about 45 in. in length, and bent into shape by a blacksmith. The board was varnished, and sprinkled with fine sand before the coat was dry, so that the surface would furnish a good foothold, and was set in position over a 10-ft. depth of water, so as to reduce the chance of accident. As the elasticity of the board subjected the cement to considerable strain when a man of average weight dived off the opposite end, the sides of the block were made to taper, and in this way the pressure of the earth against its sides prevented it from being loosened by the upward pull of the plank against the anchors. The wooden strip, which formed the board's central support, was fastened to it by wood screws, the holes being counterbored and filled with plaster, to prevent injury to the feet of the diver. The strip was attached to wooden blocks, cut to a shape similar to that of the concrete ones, so as to offer sufficient resistance to the upward pull of the board as it rebounded after the diver had made his plunge.—P. P. Avery, Garfield, N. J.

Shoe Polish for Refinishing Furniture

A merchant purchased a quantity of secondhand office furniture from one of the army cantonments, and, being anxious to give it as new an appearance as possible, he had it scrubbed with soap and water. The result was not satisfactory, as, though the dirt was removed, the bruises and scratches in the varnish were whitened and emphasized, and the surface lost what gloss it had, taking on a dull and flat appearance. One day, however, while shining his tan shoes on the oak seat of one of the chairs, he accidentally stained the surface of the wood, and its appearance was much improved at the spots where the polish was rubbed in. He therefore decided to give all the furniture the same treatment. It was of the golden or light-oak variety, and the dressing used was of the ordinary oxblood shade. It was applied in exactly the same manner as in treating shoes, that is, with a dauber; then polished with a shoe brush, and given a final rubbing with a soft cloth. The polish was applied against the grain, which forced it into the wood, but was rubbed with the grain. Whatever parts had lost their finish through injury to the varnish, took just enough of the color of the polish to make them look uniform with the rest of the surface.—Harry O. Mitchell, Atlanta, Ga.

Steel Helmet as Lamp Shade

A returned soldier made a table ornament of his helmet by turning it into a shade for an electric lamp. He stripped it of all padding and straps, and removed the rivet at the top, which was easily accomplished with a file. He then coated the inside with white enamel to give it more reflecting power, but made no change in its outer surface, as he did not wish to remove the traces of the purpose which it had originally served. Such an ornament can be given a very brilliant appearance by gilding it, or painting a design upon it; but it will be more interesting as a souvenir, if it is easily identified as a helmet. —J. W. McRae, St. Louis, Mo.



To Prevent Bruising Fruit

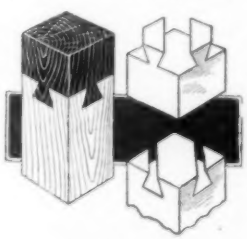
A guest at a lawn party was given a large pail of very ripe cherries to take home, but the journey meant a 40-mile drive by automobile, so that it seemed more than likely that the fruit would be bruised to a pulp. The difficulty was met by filling the pail with water and placing a piece of burlap over the top, so as to prevent the floor of the car from being splashed. The experiment proved a success, as the water acted as a shock absorber. All kinds of berries—particularly red raspberries—can be shipped in this way, and all that is necessary is to use a water-tight container.—James H. Beebee, Rochester, N. Y.

Artistic Glass Decorations of Crêpe Paper

Table napkins of crêpe paper have been used with excellent results in covering bathroom window glass, making it translucent without being transparent. It was found to admit light, but objects could not be distinguished, so that it made an ornamental substitute for frosted glass; and as the paper was decorated with colored flowers, a very artistic effect was produced. To make the paper translucent, dip it in a solution containing one part of sodium silicate and five parts of water, and then press it upon the window while still wet. The silicate has the same effect as varnish in making the paper admit light, but does not get sticky from heat, and for this reason the process can be used in making ornamental lamp shades.

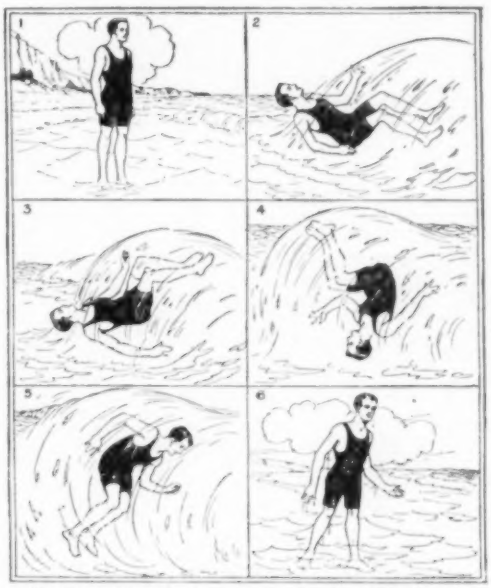
Dovetailed-Block Puzzle

A puzzle that rarely fails to mystify can be made by any boy who is handy with a chisel. A very good effect can be gotten by making one block from some dark-colored wood, and the other from pine. The trick lies in cutting the dovetails at an angle of 45°, and putting them together to form one solid block. They can be glued together, and when shown to somebody he cannot see how it is possible to get two blocks together in that form.—Chas. A. Loyda, Milwaukee, Wis.



Bather Curls Over in Surf

Plenty of fun and healthy exercise can be gained by turning back-somersaults in the surf while bathing. The bather wades out to the line where the breakers begin to curl, and when he is about shoulder-deep, he stands facing out to sea, with his eye on a coming wave. Just before the wave begins to lift to form a breaker, he throws himself on his back, and floats with his head toward the shore and his feet toward the sea. If he has judged the time and distance correctly, the curling breaker will pick him up feet first, turn him heels over head, and leave him standing on his feet, ready for the next wave. It takes a certain amount of practice to learn how to judge the time and distance, but there is nearly as much fun in failure as in success. Very large breakers are needed to turn a grown man, but ordinary surf will generally turn a boy.—F. H. Sweet, Waynesboro, Va.



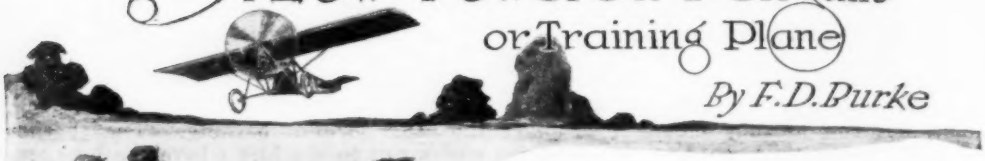
By Practicing Back-Somersaults in the Surf, the Bather Finds a Diverting Change from Ordinary Swimming and Diving

Mirror Aids in Shaving

In a room lighted by windows with small panes, it is possible to obtain a good light for shaving by placing a small mirror over one of the panes. The best way is to cut a mirror the same size as the pane, and fasten it in position with putty. —Paul Gorton, Big Rapids, Mich.

A Low-Powered Penguin or Training Plane

By F. D. Burke



A SMALL airplane which can be built with very little previous knowledge of airplane construction, and with which the rudiments of flying can be learned, is here described. The rather unusual design was adopted because it embodies, first, low cost combined with simple, robust construction, and, second, the light weight necessary to fly successfully with a motorcycle engine. The system of wing bracing is such that the wings can be easily put on or taken off in a few moments. This makes it possible to store the machine in a small space when not in use.

Principal dimensions are: 22-ft. span, 5-ft. chord, length over all 17 ft., weight empty 200 to 225 lb., weight fully loaded 375 to 400 lb. Wing section U. S. A. 3, angle of incidence 6°, power plant 10-14-hp. motorcycle engine. Total cost of materials, not including engine, should not exceed $100.

Fuselage

The construction of the fuselage should be undertaken first. As seen in Fig. 1, this consists of two ash longitudinals, tied by spruce or white-pine struts, and braced with piano wire. The wood selected should be well seasoned, straight-grained, and free from knots, pitch pockets, and winds shakes. All parts, after being cut to shape and dimensions shown, should be given at least two coats of good spar varnish. The method of assembling is shown in Fig. 2. Turnbuckles of the type shown are used throughout the

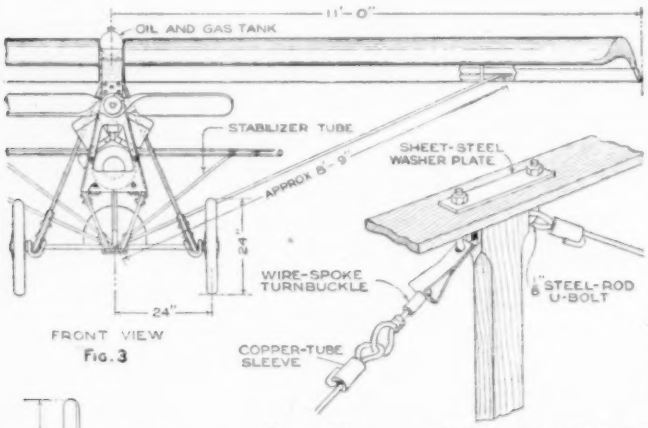
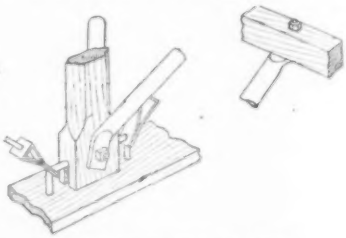


FIG. 3



DETAIL OF FUSELAGE CONSTRUCTION AND STABILIZER BRACES

FIG. 2

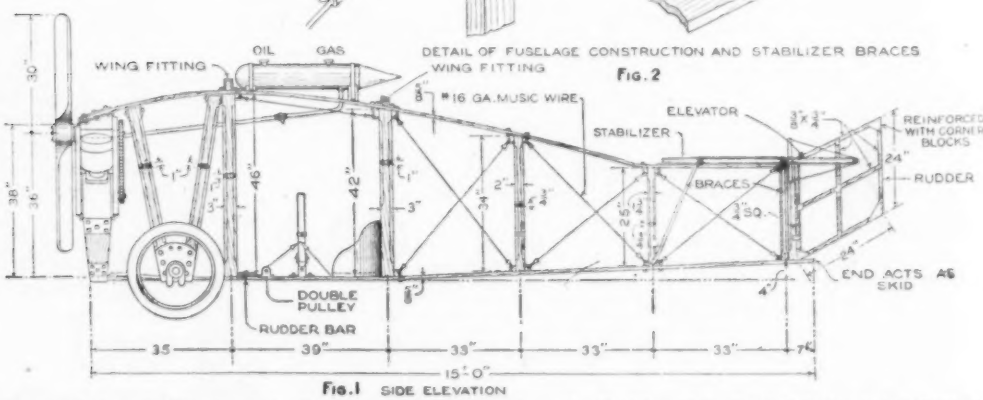


FIG. 1 SIDE ELEVATION

Figures 1, 2, and 3 Illustrate the Construction of the Fuselage, the Position of the Pilot Relative to the Controls of the Machine, and the Arrangement of the Power Plant and Fuel Supply. The Elevated Position of the Propeller Permits the Use of a Very Simple Landing Gear

machine, 26 being required. The builder should start the assembly of the fuselage from the tail post and work forward.

Engine Mounting

The sheet-steel mounting for the engine, shown in Fig. 1, and in detail in Fig. 5, can be cut from a single sheet of metal, 72 by 36 in. in size. This should be made as close to the dimensions given as the motor used will permit; the propeller-shaft mounting will be described later. Two babbitt-lined bushings, of 1-in. inside diameter, and with shoulders on one end, are pushed through holes cut for them in the top of the flanges of the motor mounting, and into the ends of a short length of tubing that acts as a spacer.

Alining Fuselage

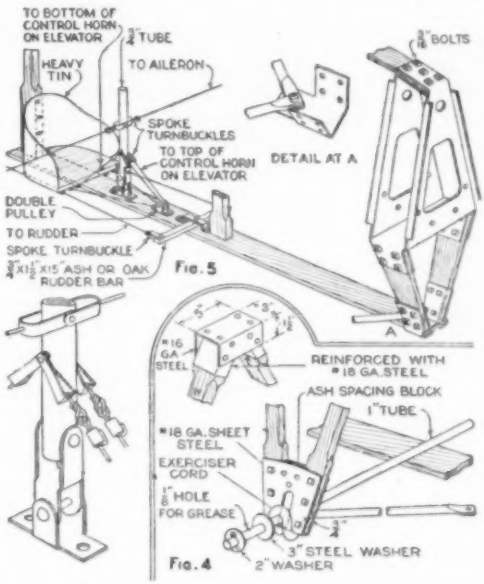
Before proceeding further, the fuselage should be carefully alined or trued up, as the handling qualities of the machine will depend a great deal upon how well this is done. The fuselage should be placed in an upright position, on a bench or plank mounted on horses. The lower longitudinal, from the engine mounting to the first strut back of the seat, should be perfectly straight. A spirit level is placed on the longitudinal just back of the engine mounting and the fuselage blocked up until perfectly level. It is then clamped firmly to the bench or planks. By adjusting the cross-bracing wires back of the seat section, the lower longitudinal can be given the amount of rise at the tail indicated in Fig. 1. When this is done, the top longitudinal between the two rearmost struts should be level. This is necessary to insure correct position of the stabilizer.

Landing Gear

The landing gear is shown in Figs. 3 and 4. Light motorcycle wheels, 24 by 2, or 26 by 2½ in., can be used to advantage. The ball bearings should be removed, and short lengths of brass tubing forced into the tubes, to act as bushings. The tubing axle should have a small amount of grease packed into each end, and a ⅛-in. hole, drilled as shown, will provide sufficient lubrication. The shock absorbers used are of ½-in. "exerciser cord," a 3 or 4-ft. length for each side of the machine being sufficient. The struts may be formed to an approximately streamline surface.

Controls and Steering Arrangement

The control, shown in Fig. 5, is of the well-known stick type. Moving the stick forward and backward controls the elevator; the side-to-side movement controls the ailerons. The foot bar is connected to the rudder for steering to the right or left. A light-weight bucket seat should be mounted as shown, and should



Figures 4 and 5 Show the Simplified Landing Gear, and Bring Out in Greater Detail the Pilot's Seat, the Controls, and the Engine Mounting

be provided with a cushion and a safety belt with a quick-release hook.

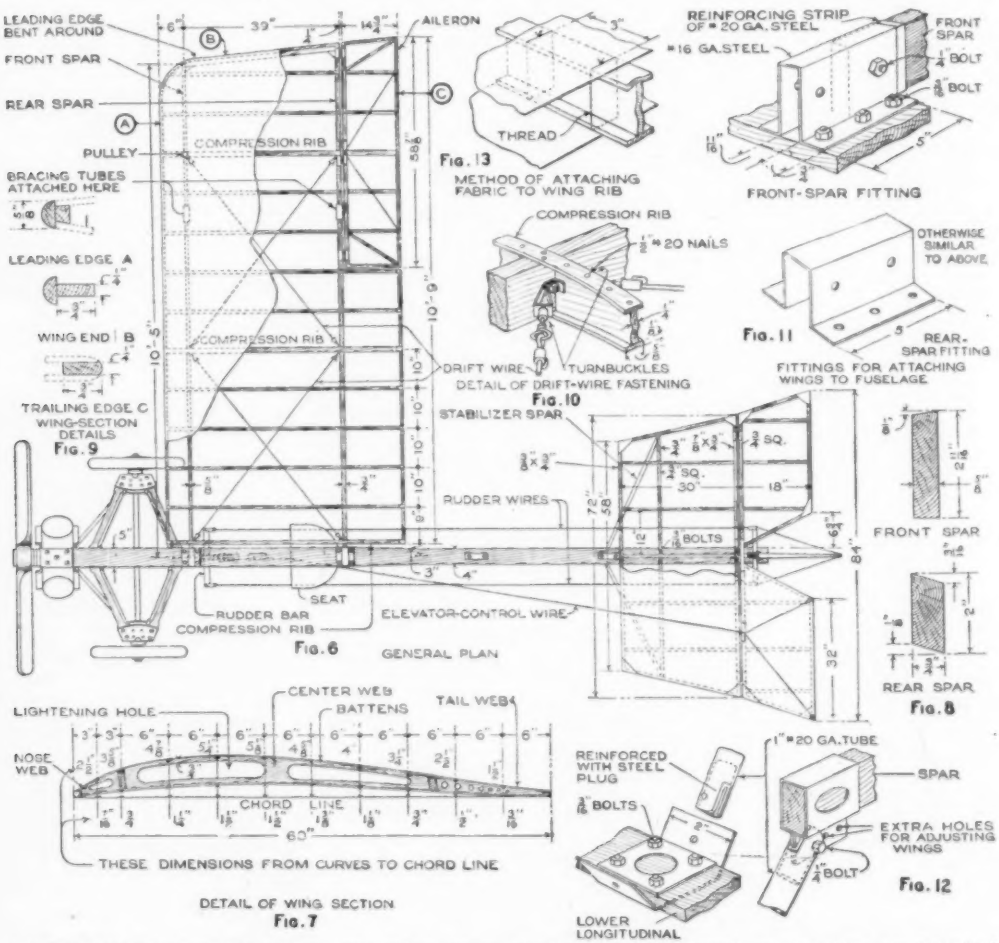
Wings

All details of wing construction are shown in Figs. 6 to 13. The ribs are of the web-and-batten type; 26 of these will be required, six of which are compression ribs, and 20 camber ribs, so called because they give the proper shape or camber to the wings. The webs for the camber ribs should be cut, as shown, from ⅛-in.-thick spruce, poplar, or white pine. The main webs for the compression ribs should be cut from ¼-in. material and left solid; those for the camber ribs are lightened as shown. The battens, of spruce or white pine, are ⅛ by ⅝ in., for all ribs. They should have grooves about 1/32 in. deep into which the webs are glued and nailed. In making up the ribs, the top and bottom battens are first glued and nailed to the center web only. The ribs are then attached to the spars, being spaced as shown in Fig. 6. The nose and tail webs are then put into place, care being taken to get them tight against the spars, which are shaped as shown in Fig. 8, to make a close fit. The

leading edge is made up of two pieces, as shown in Fig. 9. The half-round piece should be long enough to bend around the wing tip and serve as the wing endpiece, being here reinforced as shown. The drift wires, which hold the wings from collapsing, are put in as shown in Figs. 6 and 10. The fittings for attaching the wings to the fuselage are shown in Fig. 11; the location of these fittings is seen in Fig. 1. Four long tubes take the place of the usual system of bracing wires; the method of attaching these tubes to the wings and fuselage is clearly shown in Fig. 12. The correct length for the tubes can be ascertained in the following manner: Attach one wing to the fuselage, block up the wing until the outer end of each spar is 1 in. higher than the butt end. This can be arrived at by measuring the heights of both ends of each spar from the floor. With the wings in correct position, the distance from the center of the holes in the wing fittings to the center of the holes in the fuselage fittings can be measured, and the tubes made up accordingly.

Ailerons and Aileron-Control Wires

The ailerons are of the dimensions given in Fig. 6, their construction being similar to that of the rear part of the wings. They are attached to the rear spar by hinges, as shown in the detail, Fig. 14. Two small pulleys should be attached to the front spar of each wing, at the point shown in Fig. 6, one above and one below the wing. A flexible cable should run from the top control horn of the right-hand aileron, as shown in Fig.



Figures 6-13 Illustrate the Wings. The Wing Curve Used is Given in Detail, as Are Also the Principal Fittings, All of Which are Handmade, from Common Materials. A Plan View of the Wings, Fuselage, and Tail Appears in Figure 6

15, to the pulley on the front spar, across the wing, along the front spar, to the pulley on the left wing, to the top control horn of the left-hand aileron. This wire should be provided with a turnbuckle for making adjustments. From the lower aileron-control horns, wires are run to the pulleys attached to the underside of the front spars, and thence direct to the control stick, and there attached to turnbuckles, as shown in Fig. 5. When the stick is in a neutral position, the trailing edge of the ailerons should hang about ¼ in. below the trailing edge of the wings; then, when the plane is in flight, the air pressure will raise the ailerons so they will be in line with the rest of the wing. The tension of the wires should be such that a ⅛-in. movement of the stick from side to side will show a corresponding movement of the ailerons.

Tail Group

The stabilizer, elevator, and rudder are built up of spruce, or white pine, to the dimensions and forms shown in Fig. 6. The corners are reinforced with triangular wood blocks and strips of light tin. The control horns are attached, as shown in Fig. 15, at the left fork of the horn. Hinges for the elevator and rudder are of the same type as those used for the ailerons. The stabilizer is bolted to the top longitudinal of the fuselage at points indicated in Fig. 6, and braced with four short lengths of ⅜-in. No. 16 gauge tube. The ends of these are flattened and bolted to the stabilizer spars, and to the lower end of the nearest strut, as shown in detail in Fig. 2.

Wing Covering

The wings and control surfaces are covered with unbleached cotton sheeting. It should be put on the wings in the following manner: Temporarily tack the edge of the fabric to the trailing edge of the wing. Stretch the fabric across the top of the wing to the leading edge, back across the underside of the wing to the trailing edge, and tack. The two edges of the fabric should be sewed along the trailing edge and around the wing tip, the tacks being removed as the sewing progresses. The fabric is permanently tacked to the compression rib at the butt end of the wing and likewise along the rear spar where the ailerons fit in. It is also sewed to the ribs, as shown in Fig. 13, long upholstering needles being used for this purpose. The controlling surfaces are covered in the same manner. All surfaces, when covered, should be given two or three coats of airplane "dope," to shrink the fabric and make it air-tight. This dope is a cellulose preparation that can be purchased for

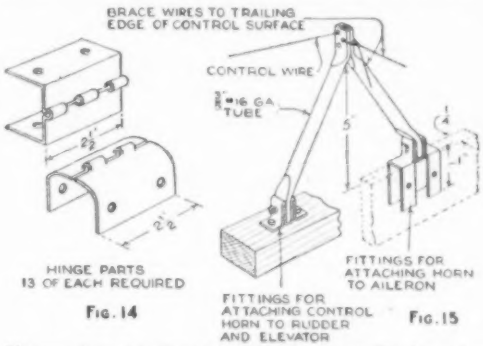


Fig. 14 Fig. 15

Hinges for the Control Surfaces, and Fittings for the Control Horns, Are of Uniform Types, Modified in Certain Dimensions to Fit the Various Parts to Which They are Attached

about $2.50 per gallon from any aeronautical-supply house. Four gallons will be sufficient to give the wings and tail planes two coats.

Power Plant

A stock twin-cylinder motorcycle engine is mounted as shown in Figs. 1, 3,

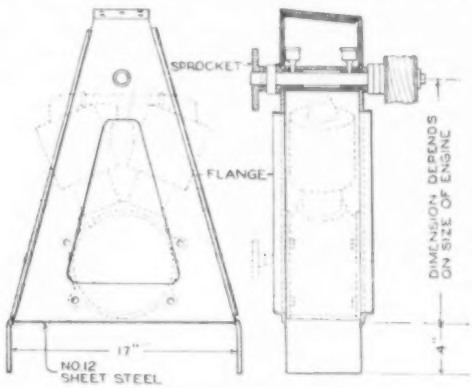


Fig. 16

The Propeller is Simply Mounted on a Short Shaft, Which Works in Well-Lubricated Bearings, and is Driven by a Motorcycle Chain

and 5. The propeller is mounted as shown in the detail, Fig. 16. Ordinary motorcycle chain is used. The propeller should be 5 ft. in diameter, and 4 ft. in pitch, with a

blade width of 5 in. A good propeller of this size will absorb power as follows: 9 hp. at 1,200 r. p. m.; 10 hp. at 1,250; 13 hp. at 1,325; 14 hp. at 1,375, and 16 hp. at 1,440 r. p. m. A gasoline tank of about 1½-gal. capacity should be mounted on the top longitudinal, as shown in Fig. 1. The spark and throttle lever should be attached to the seat and connected to the motor, preferably by Bowden wire.

Self-Training

For flying, a field, with at least one mile of straightaway, and half of a mile wide, is desirable. The first step for the student to learn is to manage his engine and steer with his feet. The setscrew on the throttle of the carburetor should be set so that the propeller will turn between 800 and 900 r. p. m. This will give the machine sufficient speed to make the rudder operative, but not enough to "get off." The plane should be started off down the field with all the controls in neutral position. Any tendency of the plane to swing off its course should immediately be counteracted by the use of the rudder. Sudden half turns to the right or left, sometimes called "pinwheeling," can be counteracted only by throttling the motor. To put the plane back on its course, the rudder should be put hard over, and the throttle opened and closed several times. The machine will gather momentum slowly, while the jerky blasts of air from the propeller acting on the rudder will swing the plane back on its course. When the student can "taxi" about under perfect rudder control, the motor should be speeded up so the propeller will turn 1,150 to 1,200 r. p. m. He is now ready for his first "hop." He should start out with his elevators slightly deflected, and run along with the tail well up, until maximum speed has been acquired. Then, gently pulling the stick back, lift the machine 2 or 3 ft. from the ground, and push the stick back to a neutral position. The hop should be continued for 100 yd. or so. Slight throttling of the motor will cause the machine to settle gently back to the ground. When the student has acquired considerable skill in making these hops, he is ready to use the full power of his motor. Allowing the machine to climb to a height of 8 or 10 ft., he gradually extends the length of his straightaway to a half mile, or more. In landing, bring the machine down to within 4 or 5 ft. of the ground before throttling the motor. Then, as the machine loses flying speed, gradually pull back on the stick to keep it from settling too rapidly.

So far, no mention has been made of the ailerons, as their use is not called for in straight flights, in calm weather. Their effect should be gradually tested out before attempting flights at any greater altitude, or making circles.

Circles should, in fact, not be attempted with a "penguin" machine of this type, unless it can be held well up off the ground with the motor slightly throttled. The altitude should be not less than 50 or 100 ft. before attempting circles or half circles, and they must be wide, without perceptible banking.

When the student has mastered the possibilities of this light training plane, he should be ready to study, in a full-powered machine, the more advanced art of flying.

MATERIAL REQUIRED

(White pine may be used instead of spruce.)

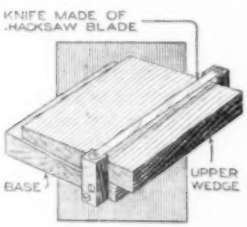
2 pieces of ash, ⅝ by 5 in. by 16 ft. 6 in.
1 piece of ash or oak ¾ by 1½ by 15 in.
1 piece of spruce, ¾ by 2 in. by 7 ft.
1 piece of spruce, 1 by 3 in. by 8 ft.
4 pieces of spruce, ⅞ by 3 in. by 4 ft. 6 in.
4 pieces of spruce, ¾ by ⅞ in. by 6 ft.
10 pieces of spruce, ⅜ by ¾ ft. by 5 in.
2 pieces of spruce, ⅝ by 2¾ in. by 10 ft. 6 in.
2 pieces of spruce, ¾ by 2 in. by 11 ft.
2 pieces of spruce, ¼ by ¾ in. by 11 ft.
2 pieces of spruce, half-round, ⅝ in. by 15 ft.
2 pieces of spruce, ¼ by ⅜ in. by 10 ft.
20 pieces of spruce, ⅛ by 6 in. by 5 ft.
6 pieces of spruce, ¼ by 6 in. by 5 ft.
60 pieces of spruce, ⅛ by ⅝ in. by 5 ft. 6 in.
1 piece of spruce, 5/16 by 6 in. by 4 ft.
2 pieces of spruce, ¾ by 4 in. by 2 ft.
1 piece No. 10 gauge sheet steel, 4½ by 9 in.
1 piece No. 12 gauge sheet steel, 3 by 6 ft.
1 piece No. 16 gauge sheet steel, 1 by 4 ft.
1 piece No. 18 gauge sheet steel, 1 by 4 ft.
1 piece No. 20 gauge sheet steel, 6 by 18 in.
4 pieces No. 20 gauge seamless steel tubing, 9 ft. long, 1 in. outside diameter.
4 pieces No. 16 gauge seamless steel tubing, 4 ft. 6 in. long, ¾ in. outside diameter.
4 pieces No. 16 gauge seamless steel tubing, 4 ft. long, ⅝ in. outside diameter.
1 piece No. 18 gauge seamless steel tubing, 24 in. long, ⅞ in. outside diameter.
1 piece No. 16 gauge seamless steel tubing, 10 ft. long, ⅝ in. outside diameter.
1 piece No. 18 gauge seamless steel tubing, 10 in. long, 1⅛ in. outside diameter.
1 piece No. 14 gauge seamless steel tubing, 5 ft. long, 1 in. outside diameter.
1 piece No. 18 gauge copper tubing, 5 ft. long, ¼ in. outside diameter.
2 lb. of No. 16 gauge music wire.
160 ft. of 3/32-in. cotton-cored flexible cable for controls.
5 small pulleys.
30 motorcycle spokes.
1 qt. glue.
12 yd. of 60-in. wide unbleached cotton sheeting.
1 pair of motorcycle wheels.
1 propeller.

Keeping Water Cold in a Canteen

The contents of a canteen can be kept cool by keeping moisture in the burlap cover. To insure this, punch a ¼-in. hole in the canteen near the screw top, and insert enough soft cotton twine to plug it, taking care that the twine is long enough to reach to the bottom of the canteen on the inside, with 2 or 3 in. projecting. Divide the twine into strands on the outside, and thrust them between the burlap cover and the canteen in different directions. They will draw enough water from the canteen to keep the cover moist.—C. R. Terrell, Grafton, Calif.

Adjustable Vegetable Slicer

The drawing shows a useful little device for rapidly cutting vegetables into even slices. The knife is made of an old hacksaw blade with teeth removed, ground to a sharp knife-edge, and fastened to the tops of two small blocks, which are in turn fastened to a wedge-shaped base. The upper wedge is a block of similar taper. Sliding one upon the other will vary the thicknesses of the slices cut. A single heavy wood screw from the underside clamps the two blocks together. A slot is cut in the base for the screw to slide in.—Jas. P. Lewis, Golden, Colo.



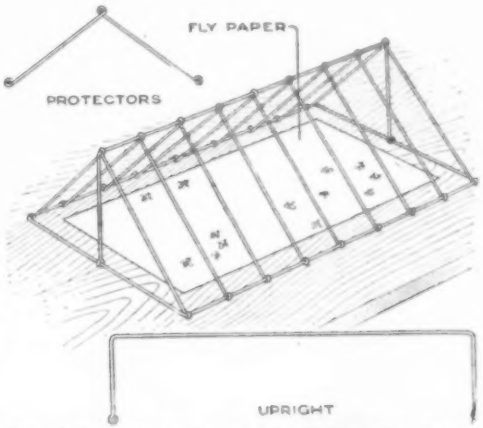
Safety Pin Repairs Coffeepot

Occasionally a coffeepot is thrown away merely because the hinge pin of the lid is lost. A small safety pin is an excellent substitute for the rivet.

¶A simple but effective method of making a fuse wire is to bore a hole into a piece of lead with a ⅛-in. twist drill. The long, curled strip of lead which comes out of the hole is used for the wire; if it is not found heavy enough, a thicker one can be obtained by exerting greater pressure on the drill, or using a larger one.

Sticky-Fly-Paper Guard

There are few households which have not felt the need of a fly-paper guard, and it is surprising that some appliance of the kind shown in the sketch is not more

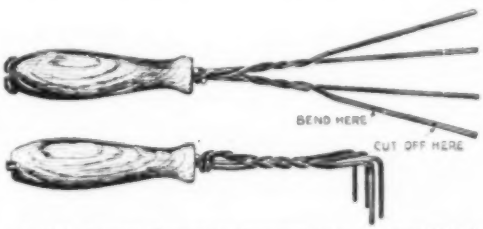


Fly Paper Protected by a Simple Wire Guard Is as Effective in Catching Flies as When Completely Exposed

generally used. It is easy to avoid the annoyance of laying a hat or other article on the sticky paper in a dark room, and a few pieces of wire fastened together in the form of a cage with gable ends will give all the protection necessary.—Arthur J. Kelly, Brooklyn, N. Y.

Weeder Made from Carpet Beater

When a wire carpet beater is broken, it can still do good service as a weeder. Cut off the ends of the wires about 6 in. from the handle, bend them as shown, and



An Old Carpet Beater is Changed into a Light Weeding Tool, Which can be Used More Handily Than the Hoe for Delicate Work

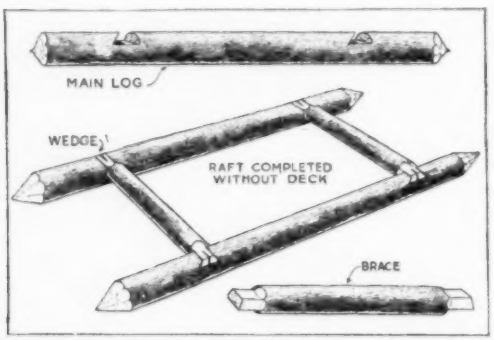
the result will be an excellent weeder for house plants and hotbeds, or even for the kitchen garden.—Milo L. Curtis, Bloomington, Ind.

¶A trunk strap was wound over the hole in a blown-out casing before inflating the tire, and proved very effective.

A Woodsman's Raft without Nails

An ingenious method of building a raft, without using either nails or ropes, has saved many a woodsman a long and tiresome journey around a lake. The only tool needed is an ax, which must be used with reasonable skill.

Two logs are cut, of desired length and size, and rolled to the water's edge. In each of these are cut two notches, about two feet from either end, and wider at the bottom than at the top. Two stout



The Skillful Woodsman Builds a Raft without the Use of Metal, and with No Other Tools Than His Ax

braces are then cut and shaped at the ends to fit the notches. One end of each brace is thrust into the notch of the same log and driven in tight. The other ends are worked into the notches of the other log, usually by shoving the log against them, fitting the ends to the notches, and forcing home with a lever.

When the braces are both in tight and projecting beyond the logs, wooden wedges are driven into their ends, spreading them in the notches and making the whole tight. A deck is made by laying on lighter crosspieces, flattened with the ax, and fitting similarly into shallow notches in the tops of the logs. The ends of the logs are often sharpened to give better headway. If more strength is needed, another brace may be used, or even several if the raft is long.

A good axman can build a raft of this kind in little over an hour.—Geo. P. Melrose, Vernon, B. C.

Tree Crickets as Thermometers

In August, when the nights are hot, and during the first cool ones of September, people who live in the country can tell the temperature by the constant and regular chirping of the tree crickets. These little creatures are nature's thermometers. When the temperature is high, they chirp fast; when it falls, they chirp more and more slowly, until at about 50° F. they cease entirely.

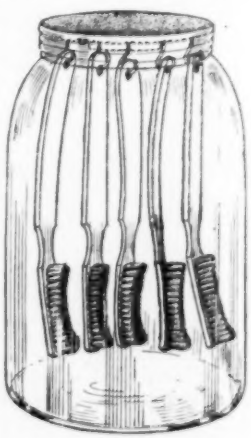
Here is a rule that gives a fairly accurate relation between the temperature and the rate of chirping: The number of chirps in 15 seconds, plus 40, equals the approximate temperature, Fahrenheit.

It is interesting to get a few of these "live thermometers" and watch them. They are generally to be found on grapevines and apple trees, but to catch them one must be very quick. Their pale-green bodies are about half an inch long, and are covered by gauzelike wings with green veins. When disturbed in their haunts they stop singing, and often several minutes will pass before they resume it. When one is discovered, just clap both hands over the leaf on which it is resting.

A large wire-netting cage is a good place to keep them in, because it can be removed from place to place, into different conditions of temperature and moisture. If they are to be kept more than a few hours, fresh leaves should be placed in the cage. When all is still, they will begin to chirp. All in a group will chirp at the same time and at the same pitch. Try some in a warm place and others in a cool one. They hold their bodies at right angles when chirping.—J. W. Wolfe, New York, N. Y.

A Toothbrush Rack and Sterilizer

A convenient toothbrush sterilizer is made from an ordinary fruit jar. A thin piece of soft board is cut circular to fit in the top of the lid. Around the edges of this, as many hooks are placed as there are toothbrushes to be accommodated. In the center of the board a little square of blotting paper should be tacked. Three or four drops of formaldehyde, placed on this blotting paper about once a week, will keep the jar and brushes entirely sterile. The lid of the jar should be kept screwed down when the brushes are not in use. —Dr. G. H. Glitzke, Kansas City, Mo.



Rope Used to Clean Gun

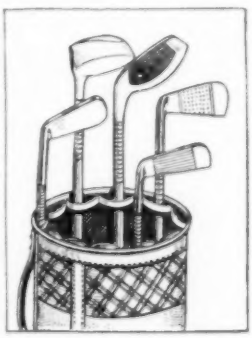
In cleaning a gun barrel, a better job can sometimes be made with a rope than with the cleaning rod. Fasten a screw eye to a post or wooden fence, and attach a rope as thick as the diameter of the bore of the gun. Run the rope through the barrel, and hold the end with one hand, working the barrel back and forth with the other. If the rope is too thin to fill the bore, tie pieces of cloth around it.—Maxwell H. Spreen, Jackson, Mich.

Signal Lamp for Electric Iron

It is difficult for a housewife to keep in mind whether the current which feeds an electric iron is turned on or not, and, as a result, a good deal of current is likely to be wasted. A small incandescent lamp will cure the trouble, if it is mounted on the same circuit as the iron, with the sockets on the iron and the lamp wired in parallel. By this arrangement, if current is turned on to feed the iron, it will also light the lamp, so that it will be possible to tell at a glance whether the current is flowing. The lamp can be screwed to the wall or ceiling at any convenient place.—J. Horace Van Nice, Waukon, Iowa.

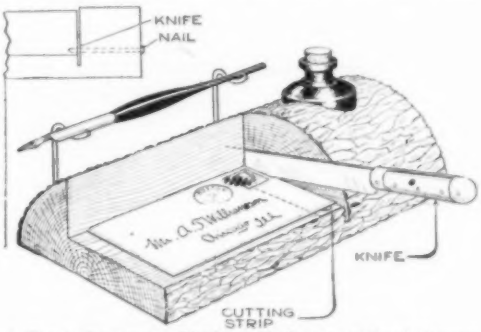
To Protect Clubs in the Golf Bag

Most golfers know what damage can be done to the shaft of a driver or brassie by being nicked and scarred by the shorter iron clubs in the bag. This will happen in the ordinary golf bag, no matter how carefully it is handled; but it can be prevented by carrying a bag which keeps all the clubs separate. Sew loops of cloth, or leather, inside the mouth of the bag—one for each club, making them small enough to hold the clubs snugly without making it difficult to withdraw them. The long clubs can then be kept on one side of the bag and the short ones on the other, so that the heads of the latter cannot do any damage.—R. H. Cochran, Lamar, Colorado.



Inkwell and Letter Opener

A combination letter opener and inkwell holder was made from a slab of wood cut from a tree trunk without removing the bark, the purpose being to give the object a rustic appearance. A portion was cut away from one end, to leave space for an ordinary envelope, as shown in the sketch, and a slot was cut with a sharp chisel at the inner end, wide enough to admit the blade of a knife. This knife was then attached to the wood



A Desk Ornament, Made of Unfinished Wood, Serves as a Pen Support and Inkstand, with an Attachment for Opening Letters

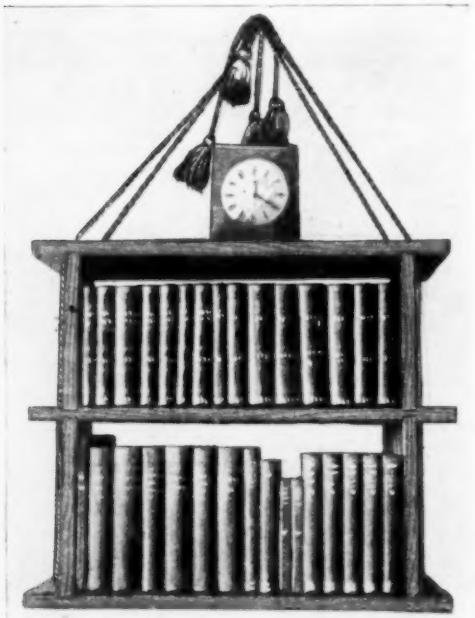
with a nail, as shown in the detail drawing, so that it was hinged at the end of the blade, and dropped into the slot when cutting off the end of an envelope. The side of the slot was reinforced with a piece of sheet steel, which fitted snugly against the cutter. An old ink bottle was sunk into the top of the slab, and fastened with putty, which was painted the same color as the wood. Two short pieces of wire bent as shown in the illustration, formed brackets to support a pen. The knife was intentionally chosen for the rough finish of its handle, so that it harmonized with the rustic appearance of the rest of the article.

Using Pine Stick for Lettering

A storekeeper, who wished to make some large signs with heavy letters, whittled one end of a soft-pine stick down to a sharp, broad edge, and used it to letter the cards. A tool made of this kind of wood works equally well with ink or paint, and, in the hands of an amateur, will make a much cleaner letter than a brush. The whittled end resembles the chisel edge on a red-sable lettering brush, so that the ordinary motions are made in using it; but, being more rigid, it demands less skill on the part of the workman.

Neat Hanging Bookshelf

This little bookshelf cost only a few cents, and about an hour's work. It requires three oak boards, 8 by 24 in. and 1 in. thick, four boards, 8 by 10 in. and of the same thickness, and two portière



Portière Ropes are Employed to Support from a Stou Hook in the Wall a Bookshelf Made from a Few Pieces of Plain Lumber

ropes. It is neater to chisel out about ¼ in. on the long boards, at the place where the upright boards will be, as illustrated. These should be placed about 3 in. from the edge, and the whole nailed securely together, but before doing this, bore two ½-in. holes at the end of each plank, close to where the upright boards will go, to admit the cord. Now nail together, stain, and polish. When dry, run the cords through, knot together at the top, and the bookshelf is finished.—C. Remington, Knoxville, Tenn.

A Two-Colored Hyacinth Bulb

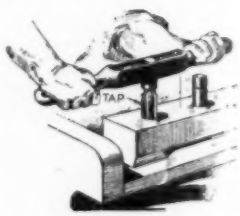
One of the exhibits at a flower show was a hyacinth having bright-blue blooms on one side of the spike and pink on the other. The plant had been grown by combining two hyacinth bulbs of varieties that bloom about the same time, one of them belonging to a blue-flowered species and the other to a pink. A portion of each bulb was cut away at the side, great care being taken not to damage the central shoot, although it was left fully exposed. The larger parts of the bulbs carrying the shoots were then tied together facing each other, and a little moss was tucked into the crack between them to keep out moisture. The double bulb was then planted in the usual manner, and when it started to grow, the flowering stems came up as one, the stalks completely amalgamating. The flowers which grew were blue on one side and pink on the other, the middle blossoms sometimes being party-colored.—S. Leonard Bastin, Bournemouth, Eng.

Preserving Crease in Soft Hats

A soft hat loses the neatness of its appearance if the depression, or crease, in the crown is not sharply defined. One or two metal clips of the kind used on stationery can be placed inside the hat to hold the material and preserve its shape, without causing any inconvenience to the wearer.

Turnbuckle Used as a Tap Wrench

A small turnbuckle of suitable size makes a handy wrench for use with taps and reamers. Remove the eyebolts from both ends of the turnbuckle, and file the inside surfaces of it flat to make them fit snugly against the squared end of the reamer or tap. Face off the ends of the bolts, screw them back in, and the tap wrench is ready for use. As thus made, the wrench will, of course, be suitable for only one size of shank, but it can be made useful for various sizes by filing a taper in the turnbuckle from one end of the inside space to the other. In order that the tap or reamer may be placed at or near the ends of the space, to fit at the place where the width is suitable, it will then be necessary to remove the original eyebolts, unless they have extra long threads, and substitute bolts long enough to reach a tap which on account of its size must be held at either end of the turnbuckle.—W. C. Reichard, Syracuse, New York.



Electric-Light Globes as Targets for Practice Shooting

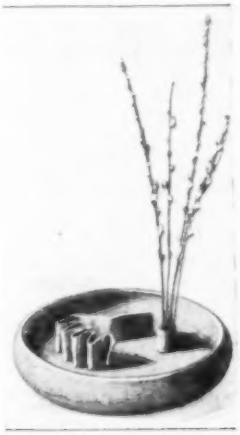
Burned-out electric-light globes make good rifle targets, whether fixed stationary or thrown into the air. When struck they give certain proof that a hit has been scored. They also make a good floating target, if painted black and thrown into a pond.

Acid Repairs for Leaking Radiators

Leaks are sometimes caused by slight cracks in the surface of radiators and other metal containers of liquid. Paint the cracked part with nitric, sulphuric, or some other strong, acid. It will cause corrosion at the "lips" of the crack, and the resulting salts will, in a few minutes, stop the leak, unless it is too large for the method to be effective.

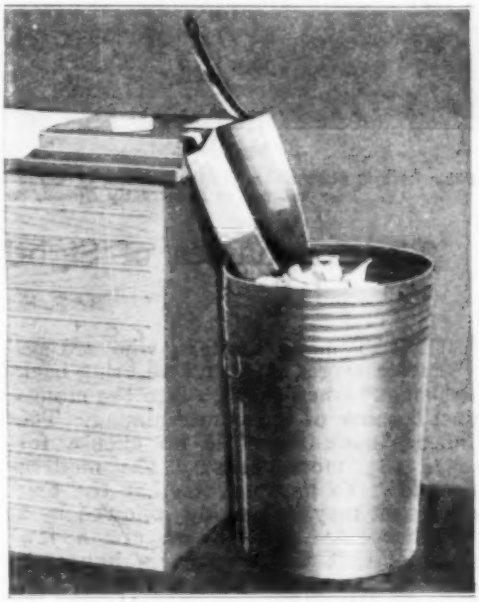
Lead Ribbon for Holding Cut Flowers

A strip of lead ribbon, about 1½ in. wide, is extremely useful in arranging cut flowers and blossoming twigs. The ribbon, which is cut from the end of a long sheet, can be obtained from any dealer in plumbers' supplies, and is so pliable that it can be rolled up or bent into any shape desired. It is especially useful with the low Chinese bowls sometimes used for holding flowers, as in a bowl of this kind it is necessary to have some sort of support for the stems. Holders for this purpose can be bought in stores, but are not always of the desired shape, whereas a strip of lead ribbon can be bent to make openings of exactly the right size for the flowers or twigs which are to be displayed. They can be bunched together, encircled by one band, or distributed about the bowl and held in position by folds made in the ribbon according to the taste of the home gardener. In this way a wide-mouthed vase can be made to furnish a large variety of effects. The metal itself may be a little unsightly, but it can easily be hidden by pebbles and moss.



Chute Carries Trimmings from Prints to Wastebasket

A photographer, tired of the accumulation of trimmings from photo prints which littered the space around the trimming board on his worktable, bent a sheet of tin into the shape of a rectangular chute,



Trimmings from Photo Prints Fall Directly from the Trimming Board, through the Chute, into the Waste Can

as shown in the photograph, and fastened it by the trimming board at the end of the table. As the waste pieces fall from the trimmer, they pass through the chute into the receptacle below, thus affording a constantly clean worktable and a considerable saving of time.

To Vignette a Photograph

A simple way to obtain a vignette effect, without a mask made for the purpose, is as follows: Expose the paper as usual, wet it in clean water, and flatten against a piece of glass, with coated side out. Touch the fingers in the developing solution and gently rub the paper in the center. As the form of the picture looms up, the fingers should follow the outlines of that part which is desired to show up. The fact that the paper is wet will make the edges of the developed field diffuse. When fully developed as desired, wash in water and put in the hypo bath.—Tom Blackburn, Chicago, Ill.

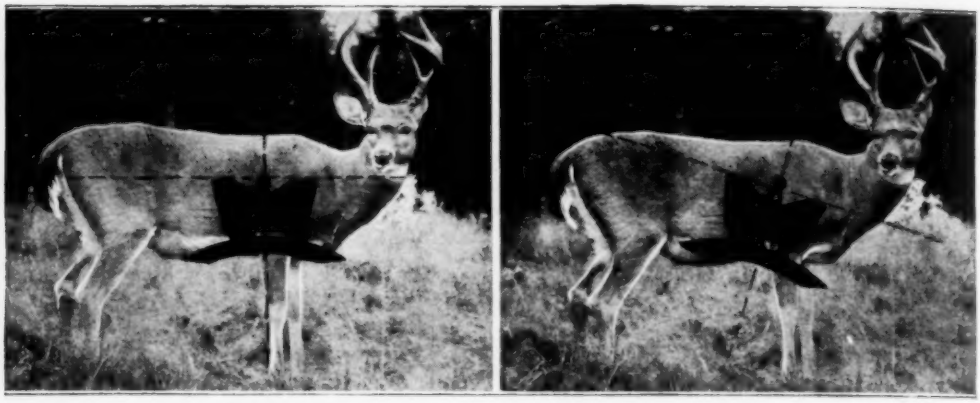


Fig. 1 Fig. 2

At the Left is Shown the Proper Aiming of Guns Provided with Open Sights. At the Right, the Same Weapon is Incorrectly Aimed, So That a Miss will Probably Result

The Mechanics of Sighting and Accurate Aiming

By F. E. BRIMMER

A GREAT many hunters, who are accurate target shots, fail to bring back the "bacon" when they go into the mountains, because of inaccurate aiming. The alibi of "buck fever" is no excuse for misses any more, because the modern rifle allows so many shots that the first faulty shot may be quickly followed by a more accurate one. There are a few principles that will help every hunter if he but bears them in mind in shooting.

In Fig. 1 is an illustration of the manner in which open sights appear when properly alined upon a standing deer. Notice that this shooter was an old hand because he held his rifle plumb. The dash lines show how the rifle was held plumb. Notice that the top edge of the sight forms a practically true horizontal line, while the top of the front sight forms with the notch of the rear sight a practically perpendicular line. Only when a rifle is held in this manner can accuracy be expected.

In Fig. 2, the shooter did not hold his rifle plumb. At first glance one might think that just the same he got his deer, but there are two reasons for a miss, and either one of the two causes illustrated would make inaccurate shooting. In the first place, the shooter rolled his rifle to the right so that the upper edge of the sight does not make a horizontal line, nor does the direction of the front sight extend directly upward. If the bullet went in a straight line from rifle muzzle to the target, then this would not be an incorrect aim; but since the proposition of trajectory does enter, it is quite essential that the rifle be held plumb.

When the Indian shot his bow, he was conscious all the time of the principle of the trajectory, for he could plainly see the course of his arrow, and he knew that he must aim high to hit the mark. His arrow always rose higher than the target, and began to descend before it hit. Just exactly the same thing happens in the case of the bullet, but of course not to such an extent as in the case of the arrow. Remember that the bullet is thrown higher than the line of vision at every shot, and that the sights do not point the path of the bullet, as most shooters erroneously believe. The bullet travels in a curve while the sights are alined as though the bullet sped in a perfectly straight line.

The greater the distance, the higher the curve, with respect to the imaginary straight line from sights to target. A rifle that has a higher velocity will have a flatter trajectory than the low-velocity rifle. This means that with high velocity the actual path of the bullet does not differ so much from a direct line from rifle to target. However, no rifle can have an absolutely flat trajectory. In Fig. 2, the shooter, by rolling his rifle barrel to the right, caused his bullet to speed way to the right of the deer, or if a hit was made by accident, it was only in the forward legs of the deer, and a wounded animal was the result. Probably this is the most common error in shooting at game in the woods.

The second reason why the shot would have failed to hit the deer in a vital place, in Fig. 2, is because too coarse a sight was taken. Notice that the front sight sticks up much farther than in No. 1.

This caused the bullet to fly high, and is another very common mistake made in the haste to shoot a deer, moose, caribou, or elk. At the rifle range plenty of time is allowed for proper alinement, and there is practically no excitement, while in the woods the stress of haste and excitement make it very difficult for the average shooter to hold his gun plumb, and at the same time take just the right amount of front sight in the notch of the rear sight.

Practice standing before a mirror, with the rifle held as if to make a shot. After the gun has been thrown to the shoulder, quickly see if the butt fits against it in a perpendicular manner. By acquiring the habit of correct holding, one can overcome the wrong manner of turning or rolling the rifle to one side or the other when doing quick shooting. Watch the faults in the mirror until the correct form is attained. When standing upright, it is easy enough to hold a gun plumb, but in the woods one often has to shoot from a cramped position and under other unfavorable conditions. None of these handicaps need cause poor shooting after a reasonable amount of practice in holding the rifle plumb.

In Fig. 3 is illustrated the way peep sights will appear when properly alined to bring down the deer. This is one of the mechanically easiest sights to use, because so much of the front of the barrel shows to the eye that there is not the tendency to roll over the barrel as in the case of open sights. Yet this may be done unconsciously, if a leaning tree happens to stand in line behind the deer. In this case the eye is deceived into believing that the tree is perpendicular, as most three trunks are, and so the shooter allows the barrel to roll to one side or the other just a very little. This causes a clean miss or a wounded deer, for the same reason given in the case of the open sights.

Another type of sight that is used for long shots at standing game is the telescope sight, illustrated in Fig. 4. In this case two cross-hairs, placed at right angles, determine the aim of the bullet. In the illustration the sighting is correct. Since this type of sight is used for long distances, it is more important to see that the rifle is not allowed to roll over on either side, because the error will magnify as the distance increases.

A careful study of the mechanics of sighting illustrated by these four photographs will be of great help to the field shot. Unless the rifle is held mechanically correct, there is no ammunition made that will get game. The same principles will hold true for the shotgun, in the field or at the traps.

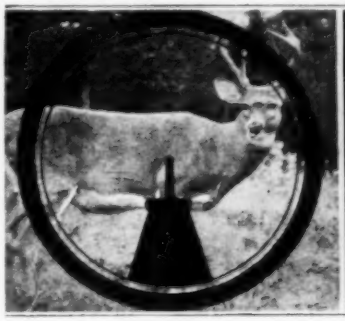


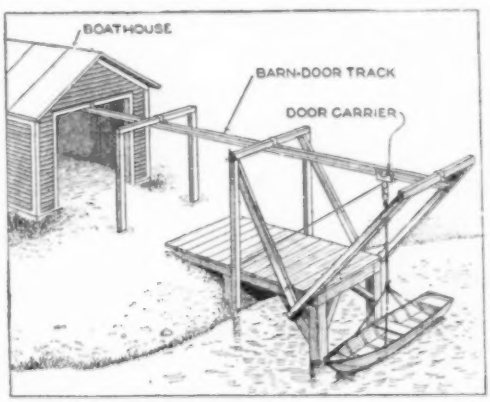
Fig. 3

Fig. 4

To the Left is Shown the Correct Aiming of Peep Sights; to the Right, Correct Alinement of Telescope Sights

Trolley Carries Boat into House

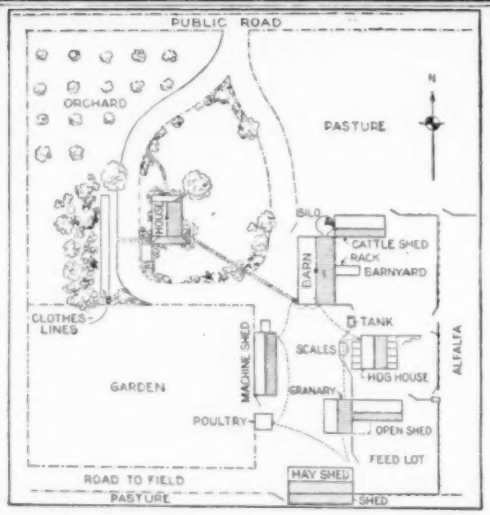
A group of boating enthusiasts simplified the work of launching their boat by using an overhead track composed of several sections of the I-beam rail used to support a sliding barn door. The boat hung from a tackle block attached to an ordinary barn-door carrier, and was slung by means of large screw eyes, placed 3 ft. apart along the gunwale.



Suspended from an I-Beam Track, a Pleasure Boat is Carried from the Boathouse to the End of a Pier and Lowered into the Water, or Lifted from It and Carried Back into the House Again

FARMSTEAD LAID OUT ON ENGINEERING PLAN

MODERN manufacturing plants are so arranged that the sequence of operations is continuous, from raw material to finished product. It is by no means impracticable to apply the same broad principle in laying out a farmstead, with due allowance for the peculiarities of each location. A model farmstead, one-fourth size, constructed and laid out by agricultural students at Nebraska University, presents the ideal elements of such an arrangement in concrete form. It represents the buildings of a 160-acre farm. The house is located on high, well-drained land, near the highway, and with a thought for the pleasantest view. Its back door, opening toward the buildings, leads into the wash room, which must be traversed on the way to the dining room. All the buildings, so placed that prevailing winds carry odors away from the house, act as windbreaks for the yards, which adjoin the pastures. Most of the fences serve two lots. Sufficient feed for the stock in each lot is stored in an adjoining building, saving much walking, and most of the buildings are accessible by team without opening gates. With this arrangement, the farmer's morning course is first to the barn, to attend to the animals there and separate the milk; then to the hog house with skim milk; next to the combined crib and granary; to the hay shed to feed the cattle; to the poultry house; back to the barn for the cream, and home. Coming in from the field, the route to the barn leads past practically all the buildings, and chores can be done while the team is drinking at the trough and going into the barn. As between this, or a similar arrangement, and one laid out without planning, it is estimated that as much as a mile of walking a day would not be an extraordinary saving. Further points for study are the use, other things being equal, of unproductive land for building sites; provision, if possible, for running water in the house, and buildings opening to the south, for winter warmth, but with a north opening also, to create cool air currents in summer.



The Model Farmstead at Nebraska University: The Plan Drawing may be Used for Laying Out a Full-Sized Farm. The Dotted Lines Indicate the Routine Course of the Farmer

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]